5– Chapter 5: Wisconsin's Transportation System Assets

Wisconsin's multimodal transportation system carries both people and goods from their origin to destination. It provides the critical infrastructure needed to support and enhance the state's economy by moving goods on the state's roadways, railways, waterways, airports, pipelines, and through intermodal facilities (including truck-rail).

Overview of Chapter 5
• Provides an inventory of Wisconsin's freight-related transportation assets

This chapter provides an in-depth review of each transportation mode, including system assets and the relative magnitude of freight flows using each transport option.

5.1 Background on Wisconsin's Use of Freight Modes

A summary of the tonnage and value transported by rail, truck, water, and air is provided to place each mode in the context of its overall use in the state. The summary also includes the types of freight flows each mode supports. The following types of freight flows are used to categorize the movement of commodities on Wisconsin's multimodal freight transportation system:

- **Inbound Freight Flows –** Commodities originating in another state or country and destined for Wisconsin. Inbound commodities are not made in Wisconsin; these commodities may be used by Wisconsin industries to produce other goods, which contribute to economic activity. Alternatively, the inbound commodities may be consumed by residents of the state, satisfying consumer demand.
- **Outbound Freight Flows –** Commodities produced in Wisconsin and destined for another state or country. These flows support jobs within the state and the sale of outbound commodities brings money into the state from other states or countries.
- **Within Freight Flows –** Commodities that both originate and are destined for Wisconsin. Within freight flows are both produced and consumed in Wisconsin, supporting jobs at the origin of the commodity and at the destination. For example, within freight flows may serve as an input for manufacturing or production, which supports jobs at the destination site.
- **Overhead Freight Flows –** Commodities moving through Wisconsin, having neither an origin nor destination within the state. Overhead commodities simply use the state's freight transportation system and confer minimal benefits to the state.

Categorizing flows according to their origin and destination provides insight into benefits that the Wisconsin economy receives from a commodity movement. Understanding the types of freight flows, mode, and infrastructure used allows for infrastructure investment decisions to target projects that enable flows tied to economic output and jobs.

Overall, almost 577 million tons of freight were moved to, from or through Wisconsin in 2013.[1] Table 5-1 puts Wisconsin's multimodal freight transportation system assets within the context of modal distribution of freight

[1] 2013 IHS Transearch Database.

flows in the state. In terms of tonnage, trucking carried nearly 60 percent of freight, followed by rail at 36 percent, and water at five percent, with the remainder attributable to air and other modes of transportation.

Freight demand can be measured by using freight flow data to identify outbound (originated), inbound (terminated), within (originated and terminated), and overhead (pass through) freight traffic. Almost as much tonnage passed through (overhead) Wisconsin compared with the amount that entered or left the state as inbound or outbound traffic. Overhead freight does not add value to Wisconsin's economy in terms of job creation or economic activity. Much of this pass through freight originates and terminates in surrounding states and cities, such as Minneapolis and Chicago.

To support Wisconsin's freight movements in terms of tonnage, the state has multiple access points for shipping via truck, rail, and water. There is a significant amount of freight tonnage that is shipped overhead by rail. This can create a challenge for shippers that wish to access rail because railroads are not stopping in the state to pick up freight. In many cases, shippers have to rely on other modes, such as trucking, to ship freight to truck-rail intermodal facilities where rail can be accessed, unless shippers have an opportunity to utilize shortline or regional railroads, which can be used to connect to Class I railroads.

Table 5-1: 2013 Wisconsin Freight Shipments by Tonnage (millions)

Mode	Outbound	Inbound	Within	Overhead	Total*	Percent of Total*
Rail	24.7	57.9	3.4	120.9	206.9	35.9%
Truck	98.2	80.2	112.0	50.8	341.1	59.2%
Water	19.0	9.3	-	-	28.3	4.9%
Air	<0.1	<0.1	<0.1	-	0.1	0.02%
Other	<0.1	0.1	-	-	0.1	0.02%
Total*	**142.0**	**147.6**	**115.4**	**171.6**	**576.6**	**100%**

Source: 2013 IHS Transearch Database

**Totals may not add up due to rounding*

Table 5-2 displays freight flows measured by value, offering another perspective of Wisconsin's freight flows. The modal distribution and type of freight flow (outbound, inbound, within, and overhead) may differ between value and tonnage due to different value to weight ratios. For example, pharmaceuticals and gravel have very different value to weight ratios, making one stand out more in tonnage (gravel) and the other in value (pharmaceuticals).

As shown in Table 5-2, the value of the nearly 577 million tons of freight transported in Wisconsin is estimated at nearly $638 billion.[2] Commodities moved by truck made up nearly 70 percent of that total, followed by rail at almost 30 percent. Although the air mode shipped less than one percent of the state's tonnage, the commodities moved were typically high value and made up almost two percent of the state's total value.

[2] 2013 IHS Transearch Database.

Table 5-2: 2013 Wisconsin Freight Shipments by Value (Millions $)

Mode	Outbound	Inbound	Within	Overhead	Total*	Percent of Total*
Rail	$6,712.4	$13,156.8	$1,256.0	$158,103.7	$179,228.9	28.1%
Truck	$140,496.6	$108,924.5	$70,497.6	$125,750.2	$445,669.0	68.8%
Water	$1,259.5	$894.0	$43.8	-	$2,197.4	0.3%
Air	$5,468.9	$4,417.6	$549.7	-	$10,436.2	1.6%
Other	$26.2	$140.9	-	-	$167.2	0.03%
Total*	**$153,963.7**	**$127,533.8**	**$72,347.2**	**$283,853.9**	**$637,698.7**	**100%**

Source: 2013 IHS Transearch Database
**Totals may not add up due to rounding*

The remainder of this chapter outlines the assets that comprise Wisconsin's multimodal freight transportation system, organized by mode.

5.2 Wisconsin's Roadways

Freight shipments by truck dominated the state's goods movement in 2013 with nearly a 60 percent share by weight and 70 percent by value. Over 341 million tons of freight, valued at more than $445 billion were transported to, from, within, or through Wisconsin by truck in 2013 on Interstates and state highways. The top roadway commodities by weight included farm products, nonmetallic minerals (sand/rock/gravel), food or kindred products, petroleum and coal products, secondary traffic (primarily commodities moving from warehouse/distribution centers to retail locations), and clay, concrete, glass, and stone.[4]

Wisconsin's Roadways

- More than 341 million tons of freight moved annually by truck, valued at more than $445 billion in 2013 on Interstates and state highways
- State roads
  - Approximately 11,800 miles of state, federal and Interstate highways
  - Carry about 58 percent of Vehicle Miles Traveled (VMT)[3]
- Local roads
  - More than 103,000 miles of county highways, town roads and municipal streets

Wisconsin bridges are critical infrastructure assets of the transportation system. Wisconsin has a known inventory of more than 14,000 bridges that are maintained by their respective jurisdictional agencies.[5] While bridges do provide critical connections across the state, the issues surrounding bridges are discussed in detail in Chapter 6, *Transportation System Condition and Performance*. This section focuses on Wisconsin's roadways.

Table 5-3 and Table 5-4 display total truck tonnage and value by flow type. Overall, both tonnage and value show a relatively even distribution of flows outbound, inbound, within, and overhead traffic. In comparison to other modes, truck traffic is less likely to be overhead traffic, suggesting that trucking facilitates more Wisconsin-centric travel because shippers might not be able to easily access the other modes, such as rail and water.

[3] Wisconsin Department of Transportation, Bureau of Planning and Economic Development.
[4] 2013 IHS Transearch Database, 2 digit STCC Codes used.
[5] Wisconsin Department of Transportation, Bureau of Structures, "Annual Bridge Report." (April 2016).

Table 5-3: 2013 Truck Tonnage by Flow Type (million tons)

	Outbound	Inbound	Within	Overhead	Total
Truck Tonnage	98.2	80.2	112.0	50.8	341.1
Proportion of Truck Flows	(28.8%)	(23.5%)	(32.8%)	(14.9%)	(100.0%)
All Modes	**142.0**	**147.6**	**115.4**	**171.6**	**576.6**
Proportion of All Flows	**(24.6%)**	**(25.6%)**	**(20.0%)**	**(29.8%)**	**(100.0%)**

Source: 2013 IHS Transearch Database

Table 5-4: 2013 Truck Value by Flow Type (millions $)

	Outbound	Inbound	Within	Overhead	Total
Truck Value	$140,496.6	$108,924.5	$70,497.6	$125,750.2	$445,669.0
Proportion of Truck Flows	(31.5%)	(24.4%)	(15.8%)	(28.2%)	(100.0%)
All Modes	**$153,963.7**	**$127,533.8**	**$72,347.2**	**$283,853.9**	**$637,698.7**
Proportion of All Flows	**24.1%**	**20.0%**	**11.3%**	**44.5%**	**100.0%**

Source: 2013 IHS Transearch Database

Carrying much of the freight and supporting the majority of VMT, the remainder of this section describes the assets that comprise Wisconsin's State Trunk Highway System (STH).

State Trunk Highway System

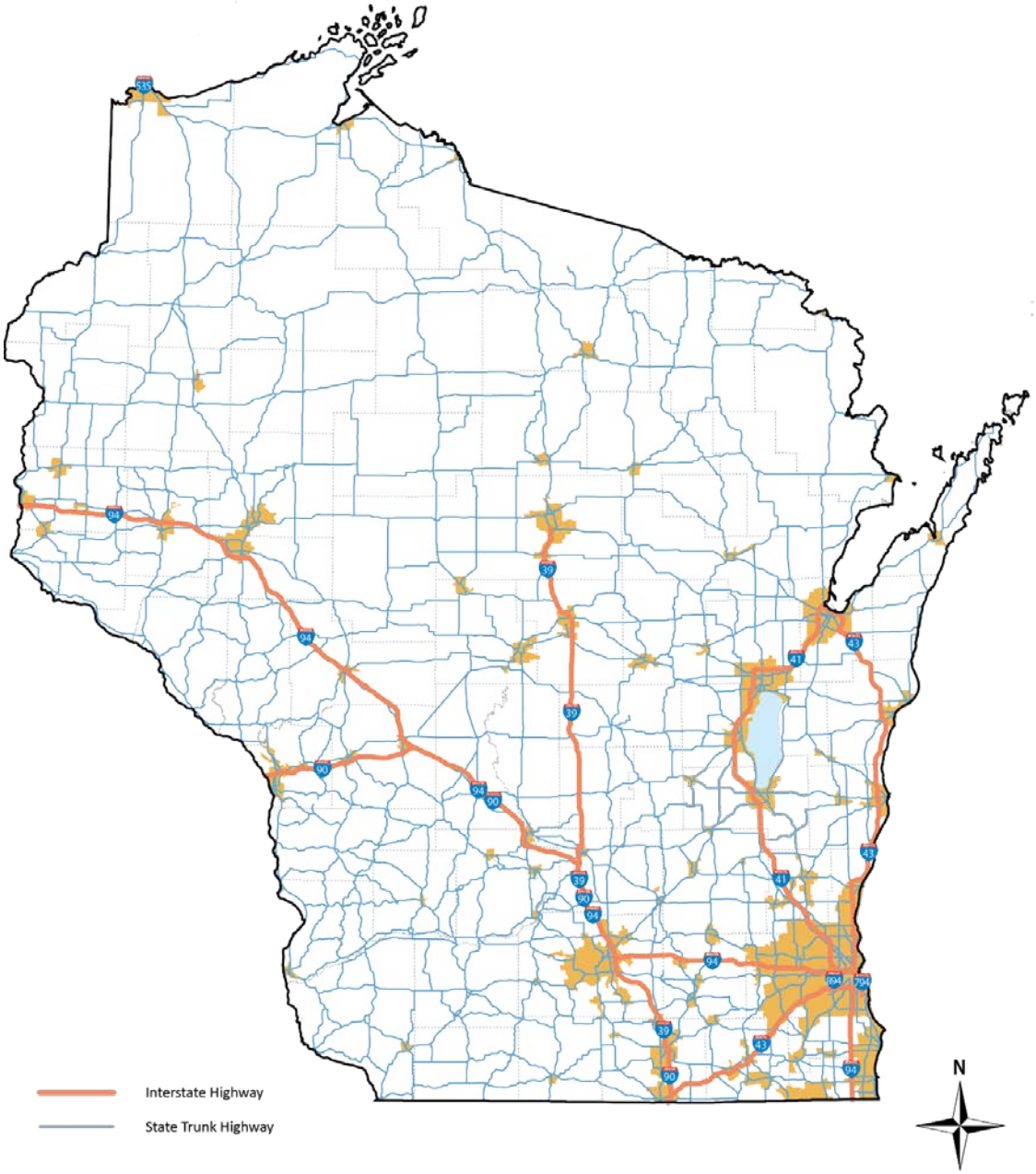
Wisconsin's STH consists of approximately 11,800 centerline miles of Interstate highways,[6] United States highways, and state trunk highways, including more than 5,200 bridges (Figure 5-1).[7] The STH system handles 58 percent of the VMT while comprising just over 10 percent of the total roadway network.[8] The STH system includes the National Highway System (NHS) and Wisconsin's designated Corridors 2030 network. Each subsystem of the STH is described below.

Centerline Miles

Centerline miles are used to measure the length of roadways. Centerline miles represent the total length of a given road from its starting point to its end point. The number and size of the lanes on that road are not considered when calculating its centerline mileage.

[6] Wisconsin Department of Transportation, Bureau of State Highway Programs.
[7] Wisconsin Department of Transportation, Bureau of Structures, "Annual Bridge Report." (April 2016).
[8] Wisconsin Department of Transportation, Bureau of Planning and Economic Development.

Figure 5-1: State Trunk Highway System



Source: Wisconsin Department of Transportation, Bureau of Planning and Economic Development

The National Highway System

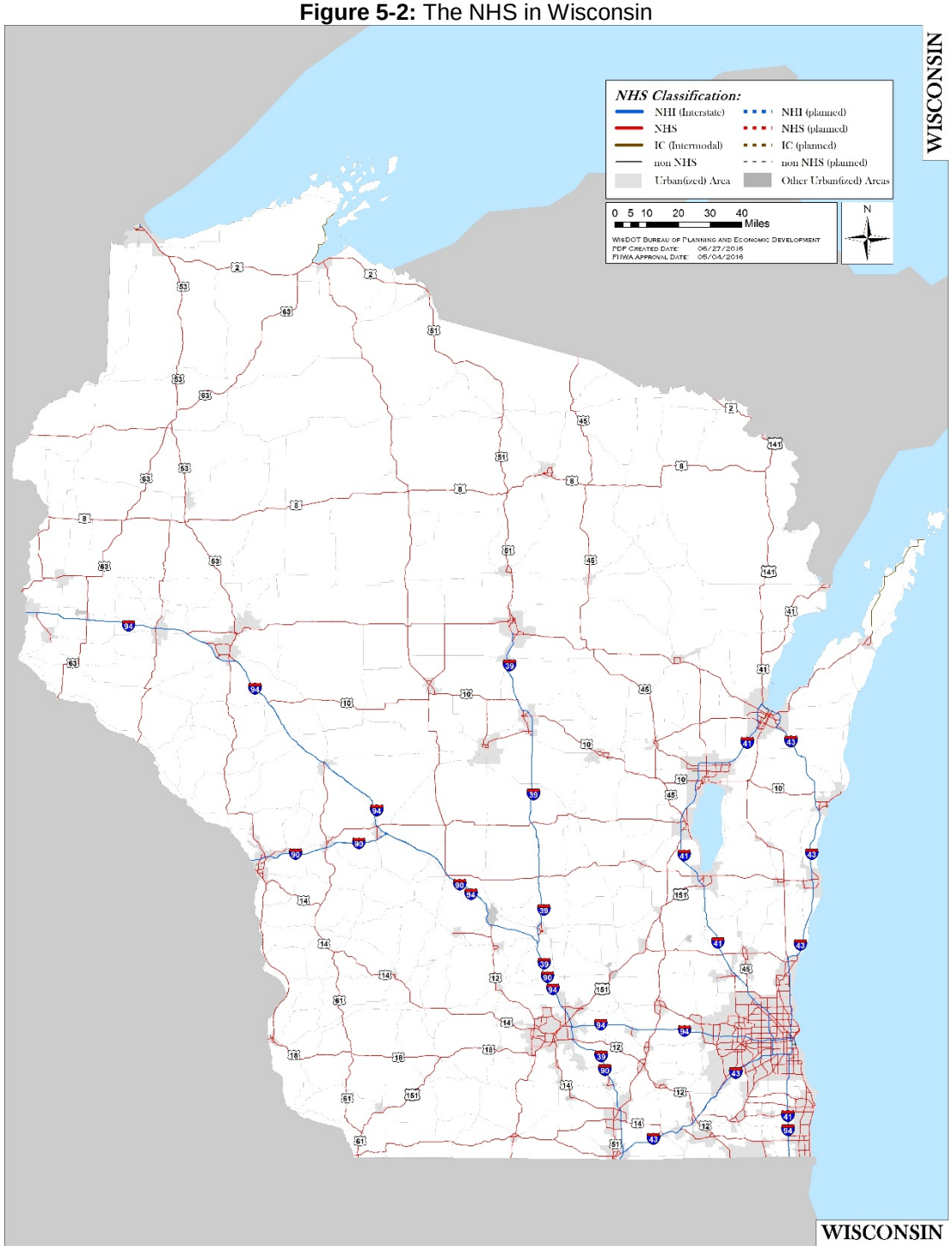
Officially designated in 1995 and expanded in the federal legislation Moving Ahead for Progress in the 21st Century Act (MAP-21), the enhanced National Highway System (NHS) includes approximately 220,000 centerline miles of roadway important to the nation's economy, defense, and mobility.[9] Roads under the NHS designation can be improved with federal-aid funds, but must adhere to Federal Highway Administration (FHWA) design criteria. The NHS roads are designated to reflect and support interstate commerce by focusing federal investments on a selection of roadways important to the movement of goods. The NHS is composed of five main roadway networks:[10]

- **Interstate –** highways important to national mobility, providing state to state connections and facilitating trade throughout the United States, as well as connecting the United States to neighboring countries. The Eisenhower Interstate System of highways retains its separate identity within the NHS.
- **Other Principal Arterials –** highways in rural and urban areas that provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility.
- **Strategic Highway Network (STRAHNET) –** highways important to the United States' strategic defense policy and providing defense access, continuity, and emergency capabilities for defense purposes.
- **Major Strategic Highway Network Connectors –** highways that provide access between major military installations and highways part of the STRAHNET.
- **Intermodal Connectors –** highways that provide access between major intermodal facilities and the other four subsystems making up the NHS.

Figure 5-2 displays Wisconsin's 5,955 miles of NHS roadway as of 2016, including 876 miles of Interstate highways and 92 miles of intermodal connector roadways.[11] The Interstate and NHS route components are critical to the movement of goods, while connector roads are important freight linkages between modes. FHWA evaluates and approves NHS connector designations that meet primary criteria, including annual passenger volumes, annual freight volumes, or daily vehicular traffic on one or more principal routes that serve an intermodal facility. Secondary criteria for intermodal connector designation include factors that underscore the importance of an intermodal facility within a state.[12]

[9] Federal Highway Administration, "Public Road Length - 2015."
[10] U.S. Bureau of Transportation Statistics, "Passenger Travel Facts and Figures 2015."
[11] Wisconsin Department of Transportation, Bureau of Planning and Economic Development.
[12] Federal Highway Administration, "Appendix A NHS intermodal connector selection criteria."

Figure 5-2: The NHS in Wisconsin



Source: Wisconsin Department of Transportation, Bureau of Planning and Economic Development

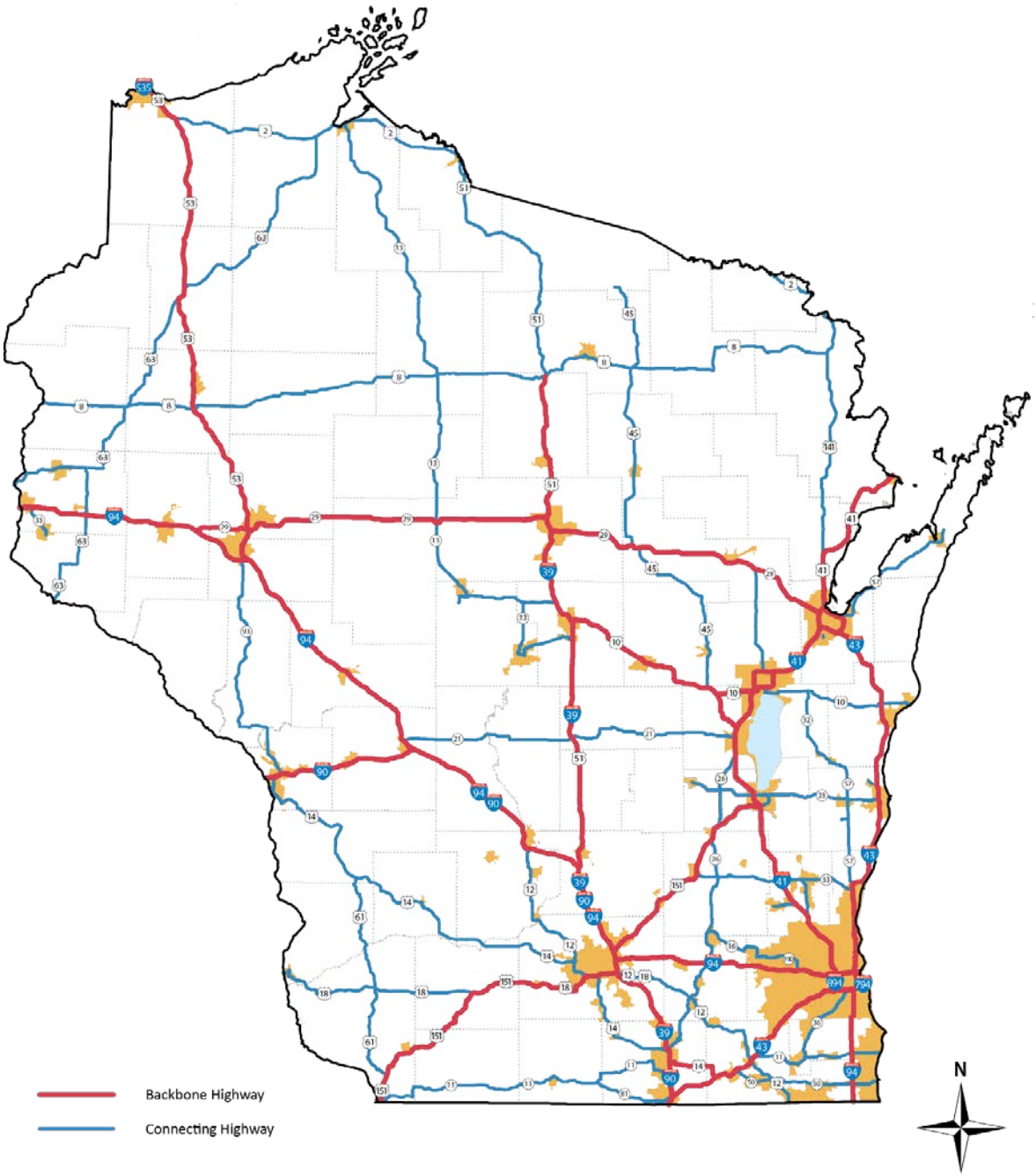
Corridors 2030

First designated as Corridors 2020 in 1988 and more recently updated as part of the state's long-range multimodal plan *Connections 2030* in 2009, Corridors 2030 is a state designation of critical highways statewide. As of 2016, these highways encompass approximately 3,930 centerline miles of federal and state highways that link all Wisconsin communities with populations greater than 5,000 (Figure 5-3).[13] These roads are considered vital to mobility and economic development in the state. The Corridors 2030 system is divided into two route types:

- **Backbone Routes** – include approximately 1,590 miles of Interstate and other multi-lane divided highways interconnecting all regions and major state economic centers, with links to the national system outside Wisconsin. Routes include: Interstates 39, 41, 43, 90, and 94; US Highways 10, 41, 51, 53, and 151; and State Highway 29.[14]
- **Connectors Routes** – include approximately 2,340 miles of predominantly two-lane highways connecting all other significant economic centers to the Backbone system.[15]

[13] Wisconsin Department of Transportation, Bureau of Planning and Economic Development.
[14] Ibid.
[15] Ibid.

Figure 5-3: Corridors 2030 Roadway System

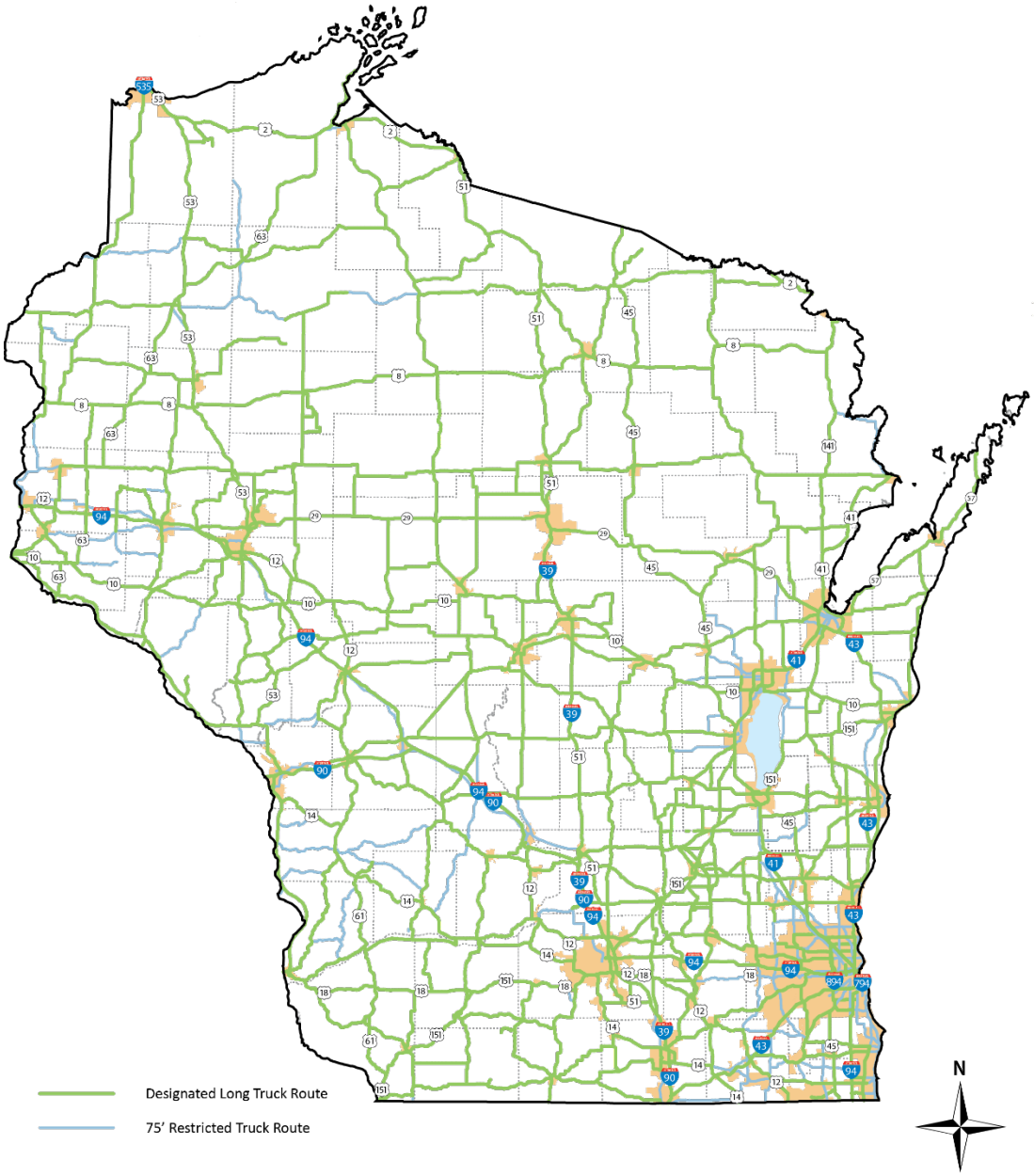


Source: Wisconsin Department of Transportation, Bureau of Planning and Economic Development

Wisconsin Long Truck Routes

Related to the Federal Long Truck Routes, Figure 5-4 displays Wisconsin Long Truck Operators map. The Long Truck Operators map identifies Wisconsin highways for the operation of vehicles and combinations of vehicles – the overall lengths of which cannot be limited. Wisconsin Administrative Code, specifically Trans 276, clarifies other statutory provisions or federal rules affecting the weight, width, and length of vehicles and combinations of vehicles and the number of vehicles in combination. The Wisconsin Long Truck Operators map conforms to Highways and Transportation Laws and Rules, Chapter Trans 276, Size and Weight of Vehicles and Vehicle Combinations.

Figure 5-4: Wisconsin Long Truck Operators



Source: Wisconsin Department of Transportation, Bureau of Planning and Economic Development

Oversize/Overweight Routes

The size and frequency of oversize/overweight (OSOW) vehicles and loads increase the stress on bridges and pavements and produces highway operational considerations specific to OSOW movements. Wisconsin, along with many other states, has made significant strides in developing a transportation system that accommodates OSOW loads. The following section describes what an OSOW load is and the designated roadway network to facilitate their movement.

As examined in Chapter 7, *Freight Transportation Trends, Issues, and Forecasts*, care must be taken to identify appropriate routes to safely and efficiently accommodate OSOW loads, such as wind tower components and construction equipment. The routing of OSOW trucks on a transportation system that was designed without the ability to predict the future of load sizes and dimensions limits the number of available primary highway routes for these movements. Although unintentional, there have been roadway designs that have limited the movement of OSOW loads. However, WisDOT has been working with industry and other stakeholders to identify barriers in order to route OSOW loads around identified impediments. Addressing these needs helps to enhance the reliability of freight movement.

Removing Barriers to OSOW Freight Movement in Wisconsin
At times, roadway designs unintentionally create barriers to the movement of large trucks and OSOW vehicles. Over the last few years, WisDOT identified several key facilities that were barriers to the movement of these types of loads. In response to industry concerns, WisDOT completed five freight mitigation projects from Manitowoc, Wisconsin to the Illinois and Iowa borders. A total of $1.5 million was invested to widen interchange loop ramps and the turn radius of a few key intersections in the state.[16] These five projects are estimated to save $300,000 annually from the Division of State Patrol's OSOW vehicle escort budget.[17] These savings benefit carriers, manufacturers, and industry. Overall, the improvements will reduce traffic congestion and improve public safety.

Wisconsin's highways support the movement of regular and OSOW loads in accordance with state and federal statutes. OSOW loads are trucks whose dimensions and/or weight exceed the legal limits and, with some exceptions, cannot be split into multiple smaller loads. A vehicle that exceeds the legal statutory dimensions usually requires an OSOW permit and must pay associated additional fees to legally travel on designated roadways. An OSOW permit typically includes conditions such as:

- Route specifics
- Dates of load travel
- Times of load travel
- Escort vehicles

The vehicle is routed to avoid permanent or temporary physical constraints of the transportation infrastructure. Some of the most referenced general maximum motor vehicle size and weight restrictions in Wisconsin are shown in Table 5-5.

[16] State of Wisconsin, Department of Transportation, "2013-2015 Biennial Report."
[17] Ibid.

Table 5-5: General Maximum Dimensions for Legal Loads in Wisconsin

Dimensions	
Width	8 feet, 6 inches
Height	13 feet, 6 inches
Length –	
Single vehicle and load	45 feet
Combination of 2 vehicles	70 feet
Truck/tractor and semi-trailer	75 feet[18]
Weight –	
Any one wheel or wheels supporting one end of an axle	11,000 pounds
Truck tractor steering axle	13,000 pounds
Single axle	20,000 pounds
Tandem axles	34,000 pounds
Maximum gross vehicle weights on all axles	80,000 pounds

Source: Wisconsin Department of Transportation, Bureau of Vehicle Services

Vertical and horizontal clearances, bridge and pavement structure strength, seasonal roadway weight restrictions, and roadway geometry and infrastructure (fixed signalized monotubes, low-hanging utility cables and signal lights, roundabouts, median geometrics, utility placement, etc.) are a few factors that may influence OSOW routing in Wisconsin.

Identifying the need to keep provide access to key OSOW roadways, WisDOT developed OSOW Truck Routes (OSOW-TR) shown in Figure 5-5. Roadways on the OSOW-TR have design guidance for intersections using five representative vehicles to test infrastructure design against the turning characteristics of OSOW vehicles. The following representative vehicles are used by WisDOT:

- 5-axle expandable-deck lowboy (DST Lowboy)
- Wind Tower 80 M MID
- Wind Tower 205'
- 55 Meter Wind Blade
- 165’ Bridge Girder

[18] Must adhere to the appropriate axle spacing to achieve a maximum gross vehicle weight of 80,000 lbs. [348.15].

Figure 5-5: OSOW Truck Routes

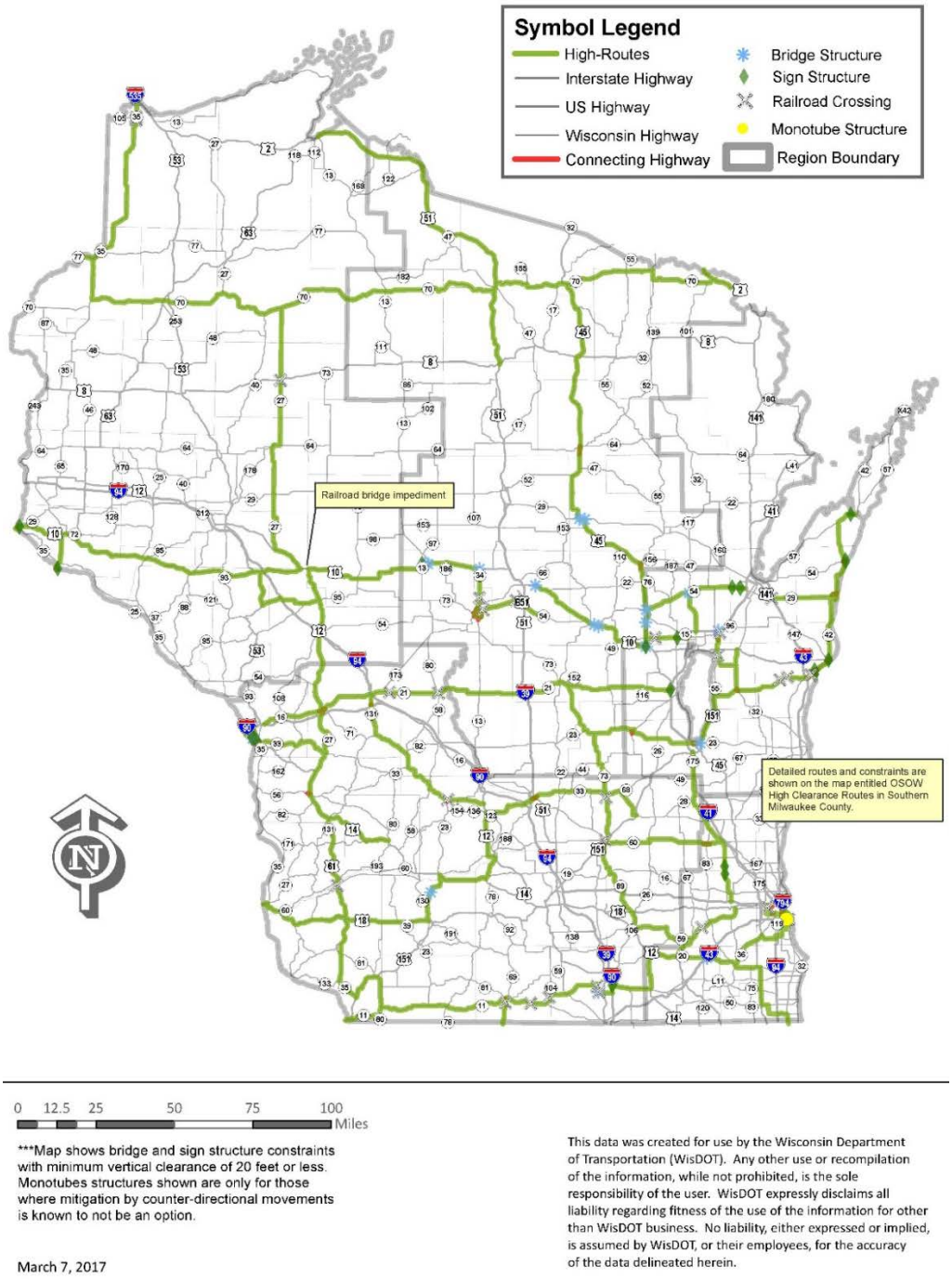
Source: Wisconsin Department of Transportation, Bureau of Highway Maintenance

WisDOT also developed the High Route Freight Corridors Task Force aimed at addressing physical constraints leading to OSOW congestion and delay. WisDOT staff reviewed frequently used high routes and selected preferred corridors based on origin/destination pairs, permit history, local knowledge, connecting highway designation, infrastructure constraints, funding constraints, and connectivity to important terminals. An iterative process was

used to align regional concerns and establish connected corridors. WisDOT's high clearance routes are shown in Figure 5-6. Similarly, Figure 5-7 displays an example of how OSOW High Clearance Routes are defined.

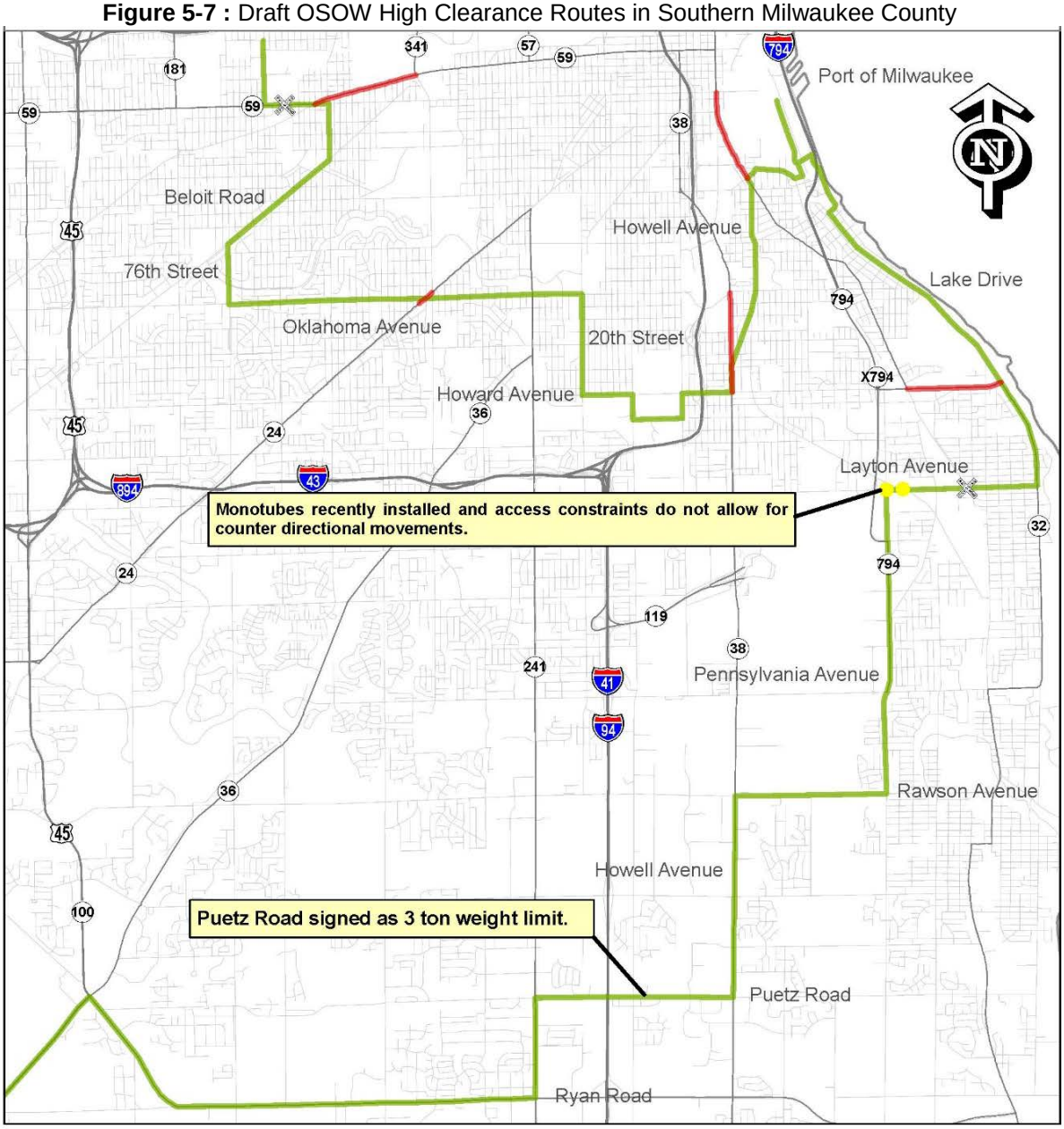
OSOW stakeholders have indicated that simply identifying the dimensional standards for state highways helps market transportation services. Essentially, this level of transparency reduces the logistical complexity of OSOW transport making state roadways capable of accommodating to OSOW freight.

Figure 5-6: Draft OSOW High Clearance Routes



Source: Wisconsin Department of Transportation, Bureau of Highway Maintenance

Figure 5-7 : Draft OSOW High Clearance Routes in Southern Milwaukee County



Source: Wisconsin Department of Transportation, Southeast Region Planning

Other Supporting Roadway Infrastructure

Wisconsin's roadway network includes supporting infrastructure that facilitates the movement of freight via truck. The remainder of this section describes truck parking facilities, Safety Weight Enforcement Facilities (SWEFs), Intelligent Transportation Systems (ITS), and the State Traffic Operations Center (STOC), which support the movement of freight via truck.

Truck Parking

In Wisconsin, truck parking is available at 30 public rest areas, which are located near Interstates and state highways.[19] Truck parking is also available at private facilities, such as gas stations or truck stops, located near Interstates and state highways. Truck parking facilities play an important role in freight operations, safety, and security in Wisconsin, and are needed for many reasons, including:

- Respite for over the road truckers
- Adherence to federal motor carrier safety standards
- Use for logistics purposes, such as staging (awaiting dispatch instructions)
- Pickup points for deliveries
- Safe areas during inclement weather conditions

A challenge for commercial truck operators is a shortage of areas near the Interstates to safely park their vehicles and rest. In lieu of available truck parking, some commercial truck drivers have parked illegally on Interstate interchange ramps or on the right shoulders of the Interstate, posing a major safety risk, potentially causing traffic bottlenecks and pavement deterioration.

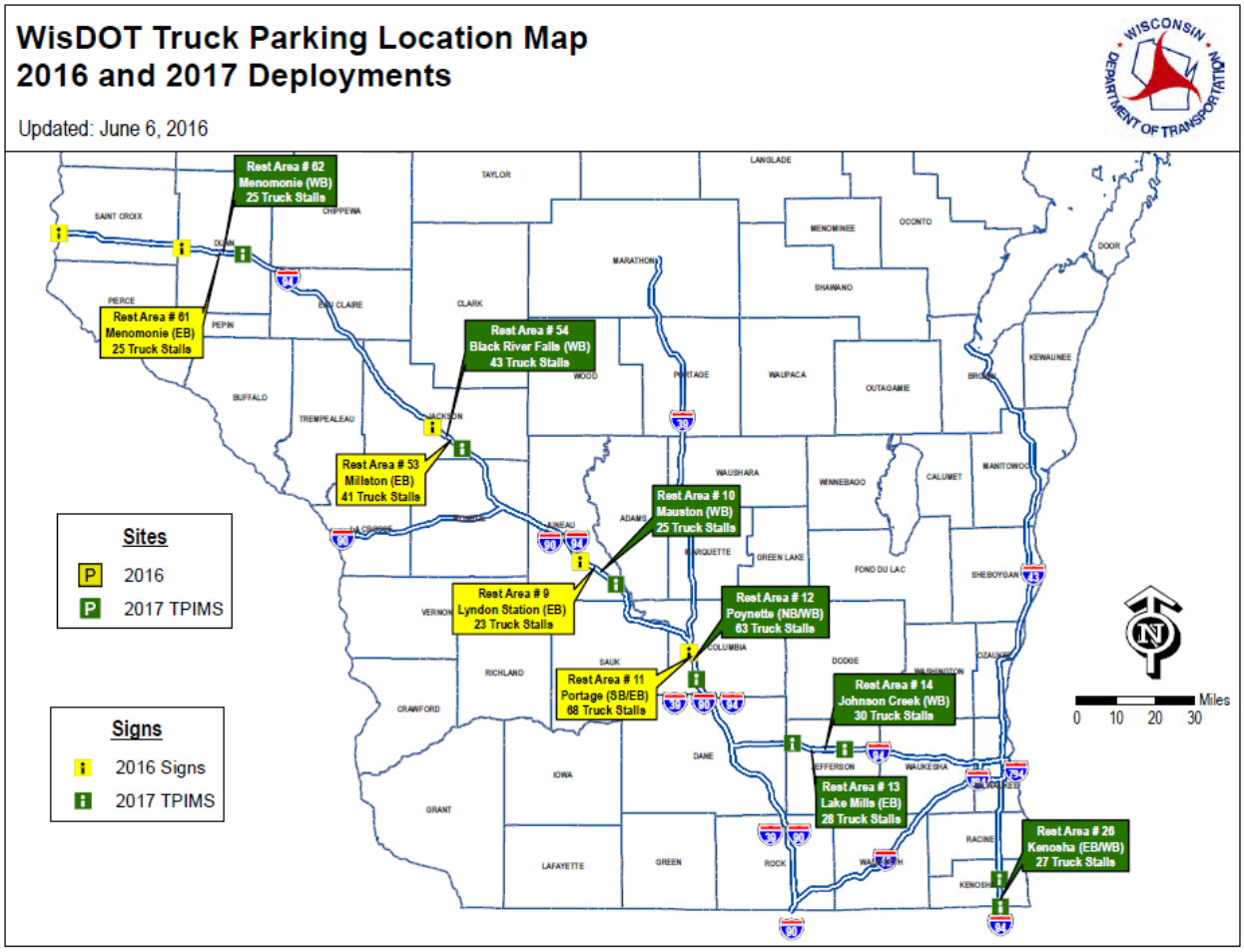
The shortage of suitable truck parking spaces presented WisDOT with an opportunity to both develop new truck parking facilities at strategic locations in the state, and to utilize new technologies to develop a more efficient way to communicate current parking availability to commercial truck drivers.

In 2014, WisDOT received a $1 million grant from FHWA to pilot a truck parking availability system in the state. The system was deployed in 2016 at four public rest areas on I-94 eastbound from Dunn County to Columbia County, which are the yellow sites in Figure 5-8. Hybrid Dynamic Message Signs (HDMS) will be installed along the corridor showing truck parking availability information.

In 2015, Wisconsin, along with seven other Midwestern states, was awarded a $25 million grant from the United States DOT through the Transportation Investment Generating Economic Recovery (TIGER) program to build a regional truck parking information management system. Wisconsin's portion of the $25 million grant is $3 million. Using HDMS, this system will include seven public rest areas along the I-94 corridor, east and westbound from the Illinois to Minnesota state lines, which are the green sites in Figure 5-8. This system will be constructed between 2016 and 2018.

[19] Wisconsin Department of Transportation, Bureau of Highway Maintenance.

Figure 5-8: 2016 WisDOT Truck Parking TIGER Grant Electronic Sign Locations



Source: Wisconsin Department of Transportation, Bureau of Highway Maintenance

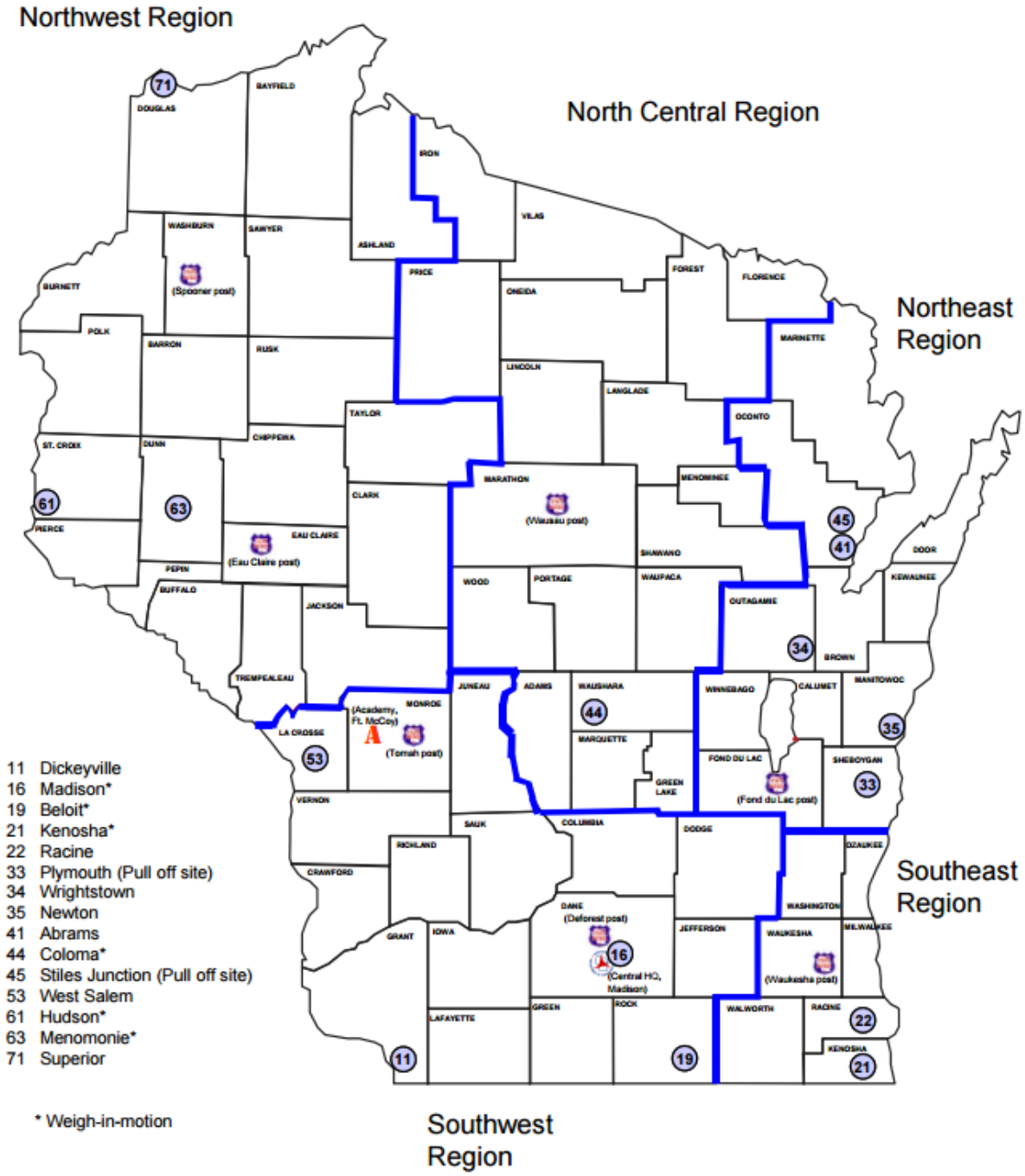
Safety and Weight Enforcement Facilities

WisDOT's State Patrol inspectors ensure that commercial carriers operate within statutory or permitted size and weight limitations while operating in Wisconsin. They inspect carriers to ensure they have proper registration, as well as insurance and authority credentials. Enforcement activities occur at SWEFs as well as through mobile enforcement using portable scales. As shown in Figure 5-9, Wisconsin has thirteen SWEFs with a scale on site and two SWEFs that require the commercial vehicle operator to pull off site to be weighed.[20]

Use of Commercial Vehicle Information Systems and Networks
WisDOT leverages Commercial Vehicle Information Systems and Networks (CVISN, pronounced "see-vision"), which provides the department with tools to improve motor carrier safety and enforcement, as well as enhance the state's revenue collection. The majority of the department's CVISN tools and technologies are housed at each of the state's thirteen SWEFs, commonly called weigh stations. WisDOT's Motor Carrier Enforcement Unit in the Division of State Patrol uses CVISN technology to monitor and enforce commercial truck operations in Wisconsin. Specifically, they monitor the legal weight, length, and height of loads. They also identify the registration, insurance, authority/permits, and fuel tax collection for the operators.

[20] Wisconsin Department of Transportation, Bureau of Highway Maintenance.

Figure 5-9: 2012 WisDOT's Safety Weight Enforcement Facilities



Source: Wisconsin Department of Transportation, Division of State Patrol

Weigh-in-motion (WIM) technology has improved commercial motor vehicle (CMV) weighing efficiency; however, WIM can only be used when the SWEF is open and law enforcement is present. The number of CMV inspections increases as a SWEF is open for longer periods of time; on average, one additional hour of operation yields approximately two additional inspections. Increasing the number of operation hours and inspections improves traffic safety as more unsafe CMVs and drivers are taken off the road.

Wisconsin Traffic Incident Management Enhancement (TIME) Program

Crashes, spilled loads, and stalled vehicles are all examples of traffic incidents. In Wisconsin and throughout the nation, these situations and the traffic congestion caused by them account for approximately one-fourth of delays on our highway system.[21] Traffic incidents also significantly impact the safety of both motorists and emergency responders.

Traffic Incident Management (TIM), a collaborative effort of public safety and transportation agencies, consists of a planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible. Effective TIM reduces the duration and impacts of traffic incidents and improves the safety of motorists, crash victims, and emergency responders.

Wisconsin recognizes the importance of TIM in maintaining the operational safety and efficiency of the state's roadways. The Traffic Incident Management Enhancement (TIME) Program is a comprehensive multi-agency, multi-discipline program, led by WisDOT, dedicated to:

- Improving responder safety
- Enhancing the safe, quick clearance of traffic incidents
- Supporting prompt, reliable, interoperable communications

The program, initiated in 1995, is a sustained initiative for assessing needs, developing solutions and strategies, and fostering the transportation-public safety partnerships that are essential for effective TIM.[22] Members of the partnership make up the TIME Coalition.[23]

Intelligent Transportation Systems (ITS)

WisDOT's ITS technologies include numerous tools to help manage highway system traffic flow from detection and response to data collection. Most of the traffic management technologies used by the department to detect and respond to transportation incidents are ITS applications such as variable message signs, ramp meters, closed circuit cameras, microwave vehicle detection, BlueTooth readers, and third party probe data.

Intelligent Transportation Systems Technologies
Detection • Roadway sensors detect vehicles moving on the highway system and are the primary source of data used to understand traffic patterns • Traffic condition cameras provide live video of traffic on the highway network • Third party probe data show real time and historic traffic volumes for select segments Response • Variable message signs inform travelers about current travel times to various destinations and locations of lane and ramp closures • Ramp meters (traffic signals) on freeway entrance ramps disperse the volume of vehicles entering the freeway to minimize congestion • Highway Advisory Radio is a network of low-power radio transmitters that provide prerecorded messages in areas with high highway construction projects and high volumes of traffic due to special events

[21] Wisconsin Department of Transportation, Statewide Traffic Operations Center.
[22] Wisconsin Department of Transportation, "Programs - Traffic Incident Management Enhancement."
[23] Wisconsin Time Coalition, "About the Coalition."

WisDOT has expanded the use of ITS to key intercity corridors statewide. WisDOT also uses mainstream ITS as a tool for other types of routine highway operations activities, including winter weather activities and work zone management. WisDOT currently uses web-based technologies for the Wisconsin Lane Closure System and the OSOW truck permitting processes. WisDOT continues to monitor the use and expansion of technologies for future use, such as connected and autonomous vehicle technologies, to further enhance the state's multimodal transportation system.

While technology is crucial to real-time operational data needs, monitoring data over time helps analyze potential trends. Storing data in a logical and accessible way for long-term analysis and future planning will aid the department in assessing changes and opportunities on the transportation system.

Measures of technological performance can take place on several levels. First is the ability of the technology system to collect and store appropriate, uncorrupted data. Second is the ability to put the right people and processes in place to access, understand, and ultimately make sound business decisions based on analysis of the data. Table 5-6 provides examples of traffic management technology and WisDOT's use of those technologies.

Table 5-6: Examples of Traffic Management Technologies

Technology	Status	Description
511 National Travel Information	Currently in use	• State-federal cooperative effort to provide real-time, route-specific information on construction zones, weather conditions, weather-related road conditions, congestion, detours, bus schedules, and numerous other items • System is active in Wisconsin and has received funding through the 511 Planning Assistance Program
Highway Advisory Radio	Currently in use	• Provides recorded information via dedicated low-power AM radio frequencies • Implemented in specific locations across the state
Wisconsin Lane Closure System	Currently in use	• Provides standard interface for lane closure operations, closure tracking, and data retrieval • Facilitates data-sharing with other WisDOT applications such as the 511 Traveler Information program, State Traffic Operations Center incident management system, and the oversize/overweight permitting system • Archives data for future analysis, as well as integration with other traffic engineering applications
GPS Traffic Tracking	Currently in use	• Monitors and addresses real-time traffic conditions and enhances the current and future state trunk highway system by archiving traffic activity • Public-private cooperative effort • Uses cell phone and fleet-based GPS traffic tracking technology to collect traffic data flow • Eliminates all personally identifiable information • Sends anonymous vehicle position to State Traffic Operations Center
Vehicle Infrastructure Integration	Under development and testing	• Requires cooperative effort among private-sector companies and federal and state agencies in multiple states • Allows vehicles equipped with vehicle infrastructure integration to communicate with embedded roadway technology and other vehicles in real-time

Source: Wisconsin Department of Transportation, Bureau of Traffic Operations

State Traffic Operations Center

In response to increasing demands on Wisconsin's STH system, WisDOT uses a wide range of technologies to manage the growing volume of traffic, provide real-time traffic information to system users and first responders, and assess existing and future operational and infrastructure needs.

The State Traffic Operations Center (STOC) is a centralized facility located in Milwaukee responsible for monitoring highway operations and managing traffic on the network. The center manages traffic on the highway system by detecting and coordinating operational activities among partner agencies, and responding through the compilation and dissemination of information to numerous users and audiences.

- Detection: The center monitors and collects information from numerous sources such as traffic detectors, closed-circuit TV cameras (in Milwaukee, Madison, Green Bay, and Wausau), computer-aided dispatch, and local law enforcement radio.
- Response: The center coordinates response activities among partner agencies, compiles and disseminates information to numerous users and audiences.

The STOC implements the following response actions:

- Manage traffic control activities in response to expected traffic congestion such as special events or traffic incidents in work zones.
- Disseminate real-time traffic information including incident location and construction-related closures, and anticipated or known delays to other WisDOT personnel, emergency service providers, public safety agencies, media, and the public. Variable message signs, Highway Advisory Radio, and ramp meters are examples of WisDOT response to delays.
- Coordinate state highway network emergency response activities via a toll-free telephone number available to law-enforcement agencies.

With the aid of cameras, road sensors, and area responders throughout the state, the STOC staff work with others to identify and track incidents and initiate appropriate responses. Currently, the STOC has cameras and direct responsibility to monitor and coordinate responses to incidents in Southeast Wisconsin, Madison, Green Bay, and Wausau. To serve statewide needs, the center coordinates incident response with local emergency providers and contacts via a toll-free number.

The center provides information to the public using direct communication, social media, variable message signs, Highway Advisory Radio, and weather displays at rest areas. The STOC plays an important role in highway safety by coordinating statewide emergency response. With the traffic control and monitoring systems operated by STOC, trucks and other commercial vehicles are able to reduce the amount of delay they encounter while traveling in Wisconsin, which helps freight carriers lower shipping costs. These systems can also allow agencies to respond faster and more efficiently to interruptions in travel caused by emergencies, accidents, breakdowns, weather, and increased congestion.

Local Roads in Wisconsin

Wisconsin's locally owned and maintained road and bridge system serves as a critical link in the state's total transportation network. With over 100,000 miles of county, town, and municipal roads and nearly 9,000 bridges,

the local road network accounts for approximately 90 percent of Wisconsin's public road mileage.[24,25] Typically, local roads are owned and operated by local jurisdictions.

As a critical adjunct to the STH system, the local road system offers connections not only to local activity centers, but also to state and national facilities of importance such as ports and economic business centers. Local roads connect to the STH, airports, rail stations, and bus and ferry terminals. They are the first and usually last link in the state's farm-to-market commerce and offer critical links for area businesses and tourists. Finally, many trips made by Wisconsin citizens, businesses, and tourists take place entirely on the local system.

In contrast to decisions made for the STH system, WisDOT does not have a direct role in the planning, construction, maintenance, or operation of the local road system. However, the department is responsible for managing and distributing local program funding. Local governments identify and prioritize infrastructure needs according to established guidelines for various state and federal funding sources.

National Highway System - Local

As of 2016, there are about 650 miles of local roads that are part of the NHS.[26] They are part of the NHS because they provide access to intermodal facilities or they are considered principal arterial roads.[27]. In some instances, these roads have not been designed to carry higher traffic volumes or heavier weight vehicles relative to their purpose as connection between intermodal facilities as the highway system.

In addition, the road network sometimes does not adequately serve OSOW trucks traveling to and from ports and intermodal facilities. This can result in trucks traveling farther distances to avoid bridges with weight limits, areas with reduced clearances, or roadways with insufficient turning radii.

While these local roads are part of the NHS, local governments are responsible for maintaining them. As part of WisDOT's freight planning and local roads coordination efforts, the department continues to work with local governments and Wisconsin's ports and intermodal facilities to identify solutions that address roadway issues for port areas and intermodal facilities.

[24] Wisconsin Department of Transportation, Bureau of Structures, "Annual Bridge Report." (April 2016).
[25] Wisconsin Department of Transportation, Bureau of Planning and Economic Development.
[26] Ibid.
[27] In 2012 MAP-21 directed FHWA to incorporate roads classified as principal arterials into the NHS.

5.3 Wisconsin's Railroads

Wisconsin's approximate 3,300 miles of railroad system make up about two percent of the nation's rail network.[30] The state's rail system is owned and operated by ten active, privately-owned freight railroads and the State of Wisconsin. The private railroads each hold Surface Transportation Board (STB) freight carrier certificates and operate over a network of mainlines, branches, industrial leads, spurs, rail yards, and terminals.

In 2013, nearly 207 million tons of freight (36 percent of the state total), valued at nearly $180 billion (28 percent of the state total) were transported into, out of, within, and through Wisconsin by rail. Primary commodities by weight, moved by rail included coal, crude and petroleum oil, natural gas, chemicals and allied products, nonmetallic minerals, and farm products.[31]

Table 5-7 and Table 5-8 display the total rail tonnage and value by flow type for Wisconsin. Overall both tonnage and value show the majority of rail traffic is traveling through the state. Overhead traffic flows via rail are almost double the proportion of tonnage and value traveling through the state on all modes.

Wisconsin's Rail System

- Wisconsin's railroad system includes more than 3,300 miles of track
- Wisconsin has 718 miles of state-assisted rail corridors, of which approximately 624 miles are publicly-owned and operated primarily by Wisconsin and Southern Railroad (WSOR)
- Wisconsin has over 700 miles of lines in Rails-to-Trails status[28]
- More than 360 publicly-owned railroad bridges
- Ten active, privately-held railroad companies operate in Wisconsin
- Ports in Milwaukee, Superior, Ashland, Marinette, Green Bay, Manitowoc, Sheboygan, Prairie du Chien, and La Crosse have freight rail access
- Arcadia and Chippewa Falls have truck-rail intermodal connection
- Coal is the top shipped commodity by rail
- By 2030, freight rail tonnage shipped to and from Wisconsin is forecasted to nearly double[29]

Table 5-7: 2013 Wisconsin Rail Tonnage by Flow Type (millions)

Mode	Outbound	Inbound	Within	Overhead	Total
Rail Tonnage	24.7	57.9	3.4	120.9	206.9
Proportion of Rail Flows	(12%)	(28%)	(2%)	(58%)	(100%)
All Modes	**142.0 (24.6%)**	**147.6 (25.6%)**	**115.4 (20.0%)**	**171.6 (29.8%)**	**576.6 (100.0%)**

Source: 2013 IHS Transearch Database

[28] Wisconsin Department of Transportation, Bureau of Planning and Economic Development.
[29] Ibid.
[30] Class I Data: Surface Transportation Board, 2014 R-1 Report; Shortline Data: Wisconsin Department of Transportation, Bureau of Transit, Local Roads, Railroads and Harbors.
[31] 2013 IHS Transearch Database, 2 digit STCC Codes used.

Table 5-8: 2013 Wisconsin Rail Value by Flow Type (millions $)

Mode	Outbound	Inbound	Within	Overhead	Total
Rail Value	$6,712.4	$13,156.8	$1,256.0	$158,103.7	$179,228.9
Proportion of Rail Flows	(4%)	(7%)	(1%)	(88%)	(100%)
All Modes	**$153,963.7 (24.1%)**	**$127,533.8 (20.0%)**	**$72,347.2 (11.3%)**	**$283,853.9 (44.5%)**	**$637,698.7 (100.0%)**

Source: 2013 IHS Transearch Database

Active rail lines serve 59 of Wisconsin's 72 counties.[32] The state's rail network also includes inactive lines still in private rail company ownership and former rail corridors that have been preserved for possible future transportation use. These corridors are protected under rail banking agreements, or they are currently being used as trails under the protection of the National Trails System Act.

Rail Transit Commissions (RTCs) have played a critical role in the preservation of freight rail service and rail corridors in Wisconsin since their inception in the late 1970s and early 1980s. RTCs help preserve rail service (or the potential for rail service), and influence policies on the future use of specific rail corridors if service is discontinued. The State of Wisconsin and RTCs jointly own over 700 miles of the state's 3,300 miles of rail.[33]

Usage Agreements

Among the large rail carriers, the industry is highly concentrated, with seven Class I railroads serving long-distance and trans-continental rail freight shipments. These companies, however, are limited by their own networks. In general, Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) occupy the western part of the country. The eastern United States is served by Norfolk Southern and CSX. Kansas City Southern is concentrated in the south. Canadian National (CN) and Canadian Pacific (CP) span the continent across Canada, but both have extensive networks within the United States, structured under subsidiary companies. CN's purchases of Wisconsin Central Limited and Illinois Central added a unique north-south service corridor across the middle part of the United States to its system. Consequently, railroads have developed cooperative use arrangements to extend their reach over each other's lines. These arrangements include the following types.

Joint Rate/Route Agreements

Two railroads establish one route (and rate) from an origin on the first rail line to a destination on the second rail line. Each railroad remains individually responsible for providing locomotives and crews over its lines, as well as loss and damage to the freight while in its possession. Joint rate/route agreements are subject to STB regulation and are a matter of public record.

Lease

A railroad or other entity (such as a RTC) retains ownership of a corridor, while an operator provides the equipment and staff to give service to the customers along that corridor. In Wisconsin, this structure has been used with frequency to maintain service on lower-density lines in the southern and eastern parts of the state. Several RTCs have signed operational agreements with WSOR. In another example from northwestern Wisconsin, Progressive Rail, Inc. (PGR) has leased a line between Chippewa Falls and Cameron from UP.

[32] Wisconsin Department of Transportation, Bureau of Planning and Economic Development.
[33] Wisconsin Department of Transportation, Bureau of Transit, Local Roads, Railroads and Harbors.

Trackage Rights

The railroad that owns a rail corridor retains all rights but may allow another railroad to operate over certain sections of its track. Trackage rights can be "full service," where the tenant has the right to serve shippers on the owner's line, or "overhead" or "bridge" meaning that the tenant cannot carry freight to and from the owner's customers. In Wisconsin, WSOR has bridge rights over CN, allowing connectivity between its southern and northern systems.

Trackage rights can be temporary or long-term. Temporary rights agreements are typically made when a disaster affects one railroad while a parallel line is fully operational. Long-term agreements can be made to allow competing railroads access to potentially profitable shippers or to act as a bridge route between otherwise disconnected sections of another railroad. Unlike joint route/rate agreements, trackage rights agreements specify that the tenant railroad is solely responsible for serving the shipper and for loss and damage to the freight. Trackage rights agreements are subject to STB regulation and are a matter of public record.

Under trackage rights, the track shared by the railroads is labeled as a Joint Facility. One special type of Joint Facility is a Union Terminal. A Union Terminal is typically owned by all the railroads operating out of the terminal, frequently as a separate company. Associated trackage is typically owned by this company, with the railroads that use it given the authority to operate into and out of the terminal by trackage rights. A noteworthy example of this is the Belt Railway Company of Chicago, which operates its clearing yard and industrial switching operations on behalf of the six Class I companies that co-own it.

Haulage Rights

Unlike trackage rights, a railroad granted haulage rights contracts with the customer over the entire route. It also supplies the cars and is responsible for loss and damage. The railroad granting the haulage rights retains direct control over operations, providing the track, train crews, dispatching services, and sometimes the locomotives. In return, the host railroad gets a cents-per-unit payment for each car moved, but is not privy to the haulage contracts with the shippers. Haulage rights are not subject to STB regulations.

Joint Use

On occasion, a rail corridor is owned by one entity that hosts its own operations, but also cooperatively allows operations by another rail company or companies. This is the operational structure for most Amtrak service outside of the Northeast Corridor, as the freight rail companies that own the lines manage the shared-use by passenger lines.

Railroad Abandonments and Rails-to-Trails

As examined in Chapter 7, *Freight Transportation Trends, Issues, and Forecasts*, rail line abandonments and efforts to preserve rail right-of-way often go hand-in-hand in Wisconsin. WisDOT has historically tried to preserve freight rail service where feasible. If preservation is not feasible, the department works with the Wisconsin Department of Natural Resources (DNR) to preserve the rail corridor for future rail transportation use by using the 1983 National Trails System Act (NTSA). The NTSA gives interested parties the opportunity to negotiate voluntary agreements with railroads to use railroad corridors for trails in the interim.

While abandonments do occur, they have differed from earlier abandonments of the late 1970s and early 1980s where entire corridors were abandoned. Over the last 23 years, thirteen abandonment applications have been approved by the STB in Wisconsin. Six of those lines were short stub-ended spurs of only a few miles in length; others occurred on Native American tribal lands.[35]

Since 1987, railroads in the state have submitted over 40 applications to the STB to abandon more than 400 miles of rail lines. Over 70 percent of the miles have been preserved or are in negotiations to be preserved for future transportation use.[36] Many of the lines are used as trails in the interim. Lines preserved under the NTSA are not abandoned. These lines retain their character as rail corridors and may be reactivated in the future. Negotiation efforts can sometimes take years in order to preserve a rails-to-trails segment.

Rails-to-Trails

The Rails-to-Trails program preserves rail corridors for future transportation uses. WisDOT works with the Wisconsin DNR to preserve out-of-service rail corridors by using the 1983 NTSA. The NTSA gives interested parties the opportunity to negotiate voluntary agreements with railroads to use railroad corridors for trails until the rail lines are rehabilitated for railroad use. As of January 2016, Wisconsin has over 700 miles of lines in Rails-to-Trails.[34]

Railroads in Wisconsin

The Association of American Railroads (AAR) and Surface Transportation Board classify United States railroads based on a combination of operating revenues and carrier characteristics. The railroads currently operating in Wisconsin are as follows:

- **Class I** – United States-based, line-haul railroads with operating revenue exceeding $447.6 million (as of 2017)[37]
- **Regional (Class II)** – line-haul railroads below the Class I revenue threshold that operate at least 350 miles of road and earn at least $20 million in revenue, or earn revenue between $40 million and the Class I revenue threshold regardless of mileage; note: AAR and the STB define Regional/Class II railroads' revenue levels differently[38]
- **Short Line (Class III)** – railroads with operating revenue of less than $35.8 million (as of 2017)[39]

[34] Wisconsin Department of Transportation, Bureau of Planning and Economic Development.
[35] Wisconsin Department of Transportation, Bureau of Transit, Local Roads, Railroads and Harbors.
[36] Ibid.
[37] Surface Transportation Board, "FAQs."
[38] American Short Line and Regional Railroad Association, "Railroad Definitions."
[39] Surface Transportation Board, "FAQs."

Table 5-9 lists each of Wisconsin's active freight railroads, their parent companies, and the total number of miles operated. In the case where the railroad property is owned by a public entity, the owning agency and parent company of the operator are both indicated. Due to the privately-held structure of railroads, information and data are limited.

Table 5-9: Railroad Mileage by Classification

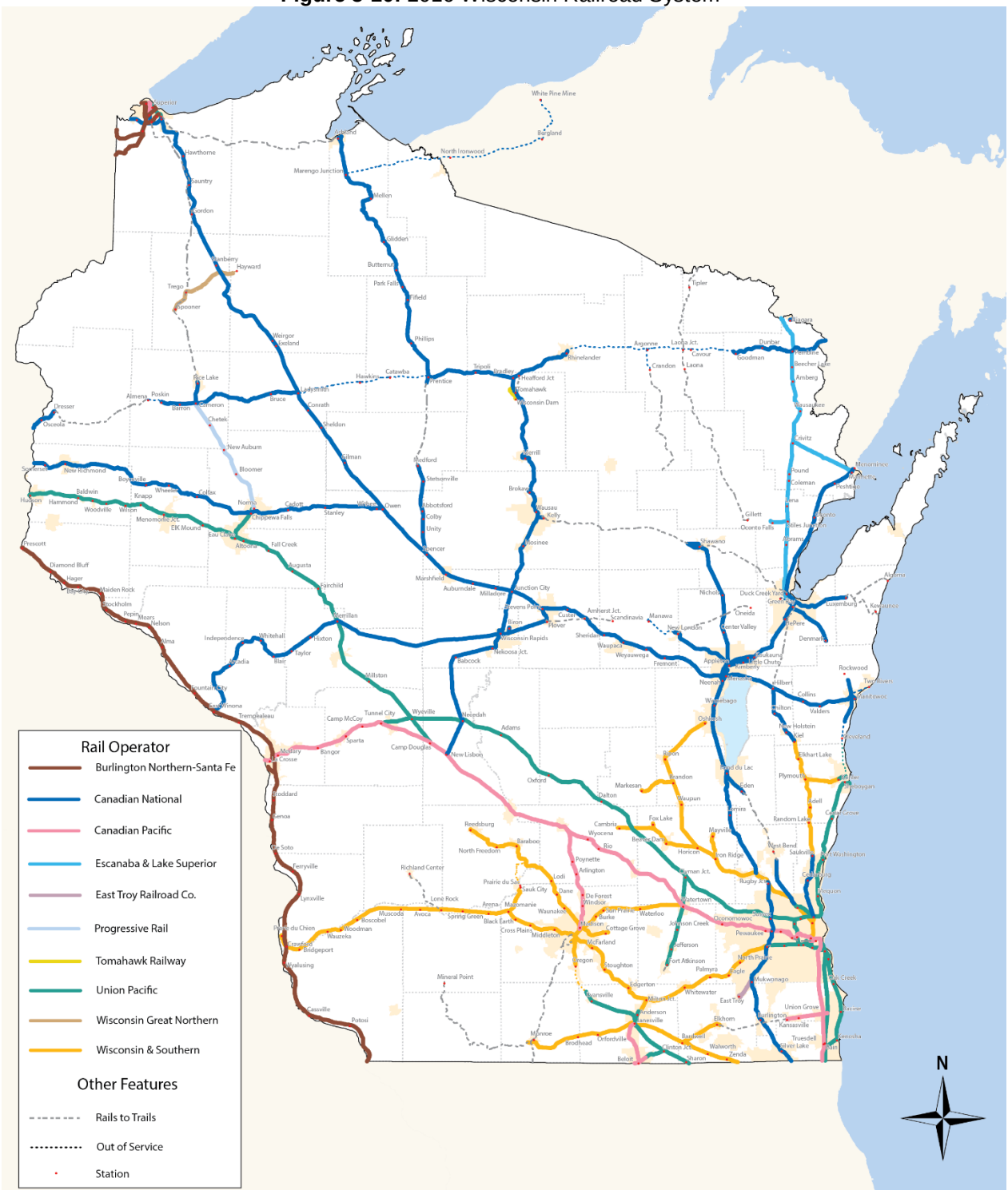
Railroad	Industry Acronym	Parent Company / Owning Agency	Miles of Track in Wisconsin[40]	Miles Operated in Wisconsin[41]	Percent of Total
Class I Railroads					
Burlington Northern Santa Fe Railroad Company	BNSF	Berkshire Hathaway	267	273	8%
Canadian Pacific[42]	CP	N/A	315[43]	621	9%
Union Pacific Railroad Company	UP	N/A	596[44]	927	18%
Canadian National[45]	CN	N/A	1,419	1,426	43%
Regional & Local Railroads (Class II & III)					
Escanaba & Lake Superior Railroad Company	ELS	N/A	114	114	3%
Municipality of East Troy Wisconsin	METW	N/A	7	7	< 1%
Progressive Rail, Inc.	PGR	N/A	38	38	< 1%
Tomahawk Railway Limited Partnership	TR	Genesee & Wyoming	4	6	< 1%
Wisconsin & Southern Railroad Company	WSOR	State RTCs; WATCO	604	686	18%
Wisconsin Great Northern Railroad, Inc.	WGN	N/A	19	19	< 1%
Total Miles Owned/Operated			**3,383**	**4,117**	**100%**

Source: Class I Data: Surface Transportation Board, 2014 R-1 Report; Shortline Data: Wisconsin Department of Transportation, Bureau of Transit, Local Roads, Railroads and Harbors. Additional out of service rail corridors exist that have been converted to a multi-use trail through the Rails-to-Trails Program. As of January 2016, Wisconsin has over 700 miles of lines in Rails-to-Trails. Operated mileage includes trackage rights, leases, and other operating arrangements.

[40] Surface Transportation Board, 2014 R-1 Reports.
[41] Ibid. Operated mileage includes trackage rights, leases, and other operating arrangements.
[42] Soo Line Railroad is the legal operating name in Wisconsin.
[43] Surface Transportation Board, Soo Line Railroad Company 2014 R-1 Report.
[44] Ownership data for 2013 includes 37-mile Chippewa Falls – Cameron line leased by Progressive Rail Inc., and 70-mile Reedsburg – Cottage Grove segment (including spurs around Madison) that had been leased to Wisconsin and Southern Railroad (WSOR). The latter lines were sold in December 2014 to WisDOT and the Wisconsin River Rail Transit Commission. WSOR will continue to operate these lines.
[45] Wisconsin Central Ltd., Sault Ste. Marie Bridge Company, Duluth, Missabe and Iron Range Railway Company are the legal operating entities in Wisconsin.

Figure 5-10 shows the Wisconsin rail system by operator.

Figure 5-10: 2016 Wisconsin Railroad System



Source: Wisconsin Department of Transportation, Bureau of Planning and Economic Development

Rail Terminals or Yards

Terminals and yards originate, terminate, and exchange traffic by building outbound trains and breaking down inbound trains, or by transferring control over unit trains. These yards include general carload classification yards, intermodal yards handling trailers and containers on flatcars, and small switching yards. Yards may also have refueling, crew change, storage, and maintenance functions. Given this key role in the rail network, a significant amount of rail capacity is impacted by the size and efficiency of the terminals and yards. The capacity of a yard is often described in terms of daily cars, containers, or trailers handled.

Major yards in Wisconsin are located in the Milwaukee metro area, Madison, Janesville, Neenah, Green Bay, North Fond du Lac, Stevens Point, La Crosse, Chippewa Falls, Altoona, and Superior. Smaller yards are located throughout the state (Figure 5-11).

Figure 5-11: 2017 Major and Minor Yards in Wisconsin

Source: Wisconsin Department of Transportation, Bureau of Planning and Economic Development

Railway-Roadway Crossings

Railway-roadway crossing safety has historically been, and remains, a concern. As shown in Table 5-10, there are over 7,100 rail crossings in Wisconsin. Rail crossings can be either at-grade or grade-separated. At-grade crossings are the most common type of crossing in Wisconsin, accounting for nearly 90 percent of all crossings in the state. At-grade crossings occur wherever a railway and highway physically intersect. Grade-separated crossings occur when the railway and roadway are physically separated by an overpass or underpass.

Table 5-10: Railroad Crossings by Type

Crossing Type	Public	Private	Pedestrian	Total
At-grade	4,001	2,267	85	6,353
Separated	678	52	31	761
Total	**4,679**	**2,319**	**116**	**7,114**

Source: Wisconsin Department of Transportation, Railroad Crossing Information System

Rail Bridges

There are approximately 400 bridges on the state-supported railroad system. Bridge structures on the rail system are evaluated by weight per rail car at a set speed metric (Figure 5-12). Bridge conditions fall into three distinct capacities:

- 286,000 pounds per car at 25 miles per hour
- 286,000 pounds per car at 10 miles per hour
- Less than 286,000 pounds per car

As shown in Table 5-11, of WSOR's 361 bridges, 70 percent are capable of bearing rail cars each carrying 286,000 pounds up to 25 miles per hour (MPH). Over a quarter (27 percent) of WSOR's bridges are in the second weight-speed category (structures capable of carrying 286,000 pounds up to 10 MPH), and less than 1 percent are in the third weight-speed category (structures not capable of carrying 286,000 pounds). There are five remaining WSOR bridges that are not categorized.

Escanaba and Lake Superior (E&LS) is a privately-owned railroad that operates 347 miles of track in Northeastern Wisconsin and the Upper Peninsula of Michigan.[46] E&LS's tracks include 40 rail bridges in Wisconsin. In 2015, 73 percent of E&LS's bridges operated at 286,000 pounds at 25 miles per hour, while 28 percent were limited to 263,000 pounds at 10 miles per hour.[47]

The state also owns one bridge on the Wisconsin Great Northern Railroad (WGNR) line that is adequate for the 286,000 pounds at 10 miles per hour.

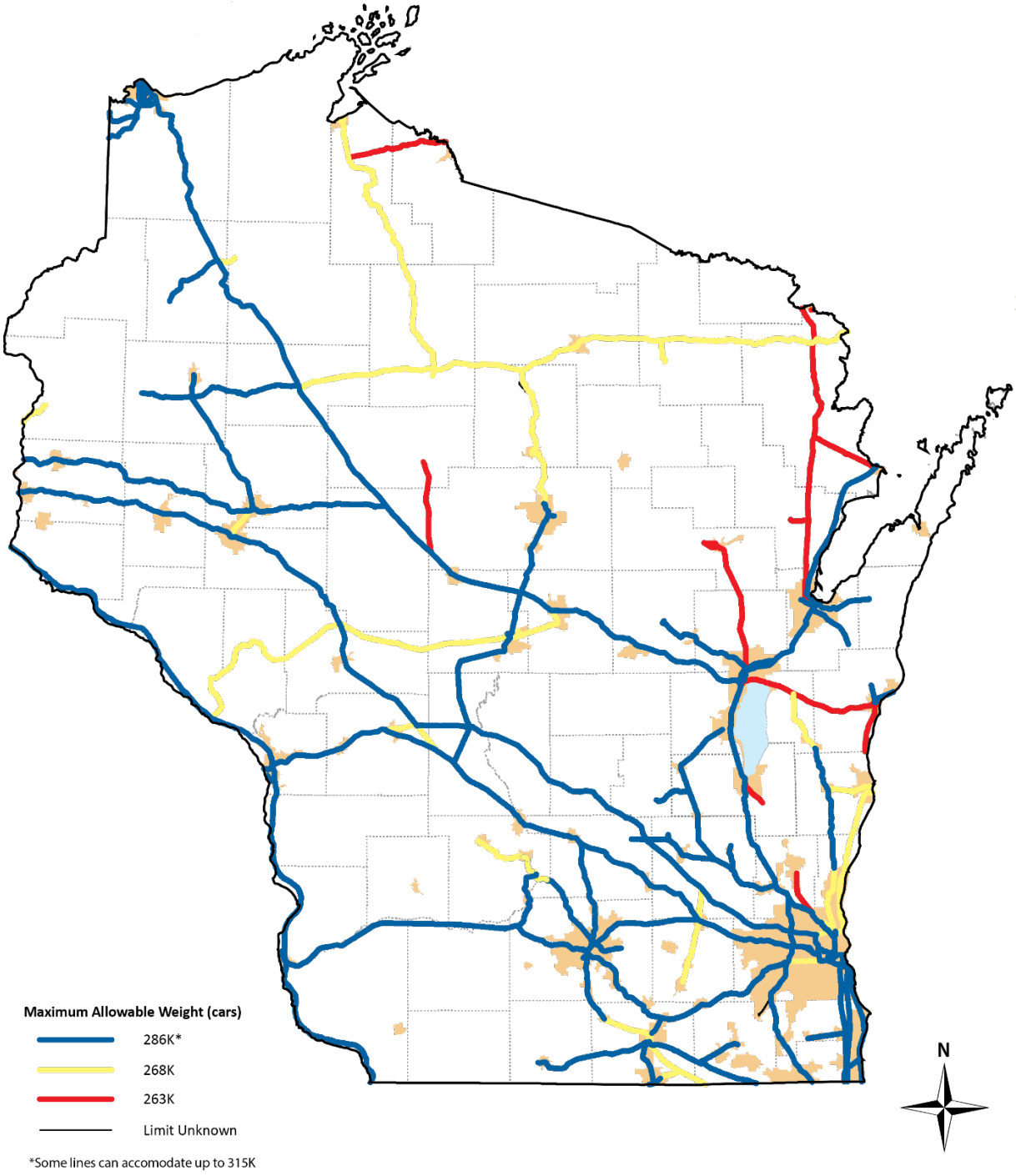
Table 5-11: 2015 Wisconsin State-Supported Bridge Capacity

	Total System Structures	Total System Structures in Lineal Feet	Structures 286,000 lbs. Capable at 25 mph	Structures 286,000 lbs. Capable at 10 mph	Structures Not 286,000 lbs. Capable
WSOR	361	31,004	254 (70%)	99 (27%)	3 (1%)
E&LS	40	N/A	29 (73%)	11 (28%)	0 (0%)
WGNR	1	N/A	0 (0%)	1 (100%)	0 (0%)

Source: Wisconsin Department of Transportation, MAPSS; note: totals do not equal 100% due to rounding

[46] Glischinski, Steve. Regional Railroads of the Midwest.
[47] Wisconsin Department of Transportation, MAPSS.

Figure 5-12: 2016 Maximum Allowable Weight per Rail Car



Source: Wisconsin Department of Transportation, Bureau of Planning and Economic Development

5.4 Wisconsin's Intermodal and Transload Facilities

Wisconsin's Intermodal & Transload Facilities
• Two intermodal facilities (Arcadia and Chippewa Falls) • More than 100 transload facilities

In its broadest sense, intermodal freight is any freight load that is transferred at least once between transportation modes during shipping. This could cover bulk (unpackaged commodities such as iron ore, gravel, corn, etc.) or containerized loads (commodities shipped in a container) transported by truck, rail, air, vessel, and/or pipeline from origin to final destination. The freight sector has adopted a narrower definition as the transport of shipping containers and truck trailers by rail.[48] The advantage of intermodal freight is that the same standardized container can be sealed in one location, moved by truck and/or rail to a port, loaded onto a vessel, shipped to another continent, then placed on a train and hauled hundreds or thousands of miles before being transferred to a truck chassis for delivery to its final destination. In this way, the economies of scale (large container ships and long dedicated trains of containerized cargo) can be maximized, while still providing last-mile delivery to a customer.

The standard measurement for intermodal freight is expressed in 20-foot equivalent units, or TEUs. Typical containers used for international shipping are 40 feet in length, or two TEUs per container.[49] These containers are part of a global freight system that utilizes large vessels, dock facilities, and inland terminals. Many vessels in operation have capacities that exceed 12,000 TEUs. By comparison, domestic intermodal service usually uses 53-foot length containers (the standard maximum length that does not require special permits). Because of its versatility, containerized shipping has almost completely replaced "piggyback" (semi-trailers on flat cars) shipping.

The critical locations for intermodal freight are the large-scale transfer facilities, which are dockside (vessel-rail or sometimes vessel-truck) or inland, usually near major urban areas and/or highway corridors (rail-truck). Intermodal facilities have gained a reputation as a reliable and economical transportation option that connects multiple transportation modes. Containerized cargo and large commodity shipments utilize rail for the longest ground portion of a movement. The freight carried by rail is then transferred to a truck at an intermodal facility, which is then delivered to a place of distribution (warehouse) or a place of final consumption.

Determining what freight can be shipped as intermodal depends on many factors, including the type of commodity, a commodity's final destination, and the length of haul. The convenience of trucking may be overshadowed by cost as the length of haul increases. Historically, the distance at which intermodal becomes financially viable has been about 700 miles. Intermodal shippers typically use a combination of modes to take advantage of each mode's strengths in order to maximize speed and service and to minimize cost.

By comparison, transload freight may follow part or all of the same route between origin and destination points, but it is not containerized. Transload freight may include:

- Rail carloads being unloaded at a warehouse to be distributed via truck to customers
- Bulk ores or grains transferred from rail car to vessel
- Petroleum products shipped via pipeline to terminals where specialized trailers are loaded and trucked to gasoline stations or other customers

[48] Association of American Railroads, "What We Haul - Intermodal."
[49] Hofstra University, "The Geography of Transport Systems - Intermodal Transportation and Containerization."

Intermodal Facility Types

Intermodal moves can be classified as direct or intermediate. A direct intermodal move usually involves truck trailers or containers:

- Trailer on Flatcar (TOFC) – a standard truck trailer on a chassis loaded onto a flat rail car and hauled to an intermodal facility where it is unloaded and hauled by truck to its final destination.
- Container on Flatcar (COFC)– a standardized/international container loaded onto a flat car or stack car where it is moved by rail to an intermodal facility and unloaded, placed on a rubber-tired truck chassis, and hauled to its final destination.

Typically, the trailer or international container remains closed or sealed. Containers are more flexible in that they can be transferred between rail, truck, and water. COFC is common at water intermodal facilities and is more fuel-efficient than TOFC for the rail portion of the move. In rail corridors that accommodate higher clearances, double stack container movements provide increased efficiencies.

An intermediate transfer, also known as transloading, occurs when goods may be stored or handled (unloaded and reloaded) before exchange to a different mode, typically between rail and truck. Transloading provides flexibility for those shippers that do not have direct rail access. By using this combination of rail and truck, customers receive the cost advantages of shipping their products by rail together with the service advantages of truck delivery.

Wisconsin's Intermodal Facilities

In Wisconsin, private sector developers generally carry out the construction and operation of intermodal facilities. Sites are selected based on the level of economic activity in the area. Two intermodal facilities are in operation in Wisconsin. Canadian National serves a facility owned by Ashley Furniture in Arcadia, and CN operates its own facility in Chippewa Falls.

Arcadia

The Arcadia intermodal facility was opened in 1994 by Wisconsin Central Railroad. The facility is dedicated to shipments to and from Ashley Furniture's large assembly plant there. The inbound containerized loads appear to be almost exclusively from Asia; outbound loads appear destined for consumer markets, likely through a transloading facility.

Chippewa Falls

Canadian National opened an 8.5-acre facility in Chippewa Falls in 2012. Community leaders had first proposed this location in 2006 after CN closed its regular freight rail yard there. The community envisioned containerized freight volumes would increase as a result of the opening of the terminal in Prince Rupert. Despite the unlikely location for a terminal (this corridor branches off the CN main at Owen, WI), this stop became feasible when paired with an intermodal stop in Minneapolis. The facility is open six days per week. Cargo contents are primarily consumer products inbound (mostly destined for Menards stores); outbound loads include grain and manufactured goods.

CN, in collaboration with the adjacent River Country Co-op, established an onsite grain transfer facility for exports. As of early 2016, this arrangement accounted for 3,000 exported containers of grain products annually. By making the transfer 'across the fence' rather than using public roads, River Country is free to load the containers above highway weight limits; recent construction added the ability to weigh containers as they are being loaded. Loads are primarily dried distiller's grain (from ethanol plants) and soybeans. Other businesses have also used the empty containers to load grains and hardwoods for export to Asian markets, including Wheaton Grain (approximately

1,500 containers per year) and hardwood timber and lumber exporters.[50] The agreement between River Country and CN was made in 2013; at that time, River Country Co-op expected to ship 15 to 20 containers per day, with 29 tons per container.[51]

Freight Advisory Committee Input on Wisconsin Intermodal Facilities
There are many factors that drive development and retention of intermodal facilities. At the April 23, 2015 Wisconsin Freight Advisory Committee (FAC) meeting, FAC members identified several factors that influence the development and retention of intermodal facilities. These include: • The presence and demand of diverse driver industries to draw sufficient volumes for shipping • Access to global markets and long-term sustainability of market accessibility • Connection of transportation modes and the balance of exports and imports • The cost of intermodal service relative to single modes, such as rail or truck • The existing infrastructure that connects intermodal facilities with state and interstate highway systems • Population, zoning, and environmental considerations • Capacity, efficiency, and technology supply-chain considerations According to the FAC, due to the demand for containerized cargo, the addition of a third intermodal facility in Wisconsin could spur economic development or encourage businesses to "cluster" within a geographical area to establish the demand threshold needed to establish an intermodal facility.

Intermodal Challenges in Wisconsin

Wisconsin's location between two major freight hubs – Chicago and the Twin Cities – places it at a competitive disadvantage for attracting and retaining true intermodal freight facilities. Over the past two decades, at least four intermodal facilities in Wisconsin have been closed, forcing shippers to use truck containers to and from higher-volume facilities in Illinois and Minnesota. The remaining two facilities – Chippewa Falls and Arcadia – retain their operations due to their major customers (Menards and Ashley Furniture, respectively).

Wisconsin's geographic location may limit the number and size of truck-rail intermodal facilities in the state.

- Wisconsin is north of many of the mainline routes of the UP and BNSF. These two railroads connect the southwest and western U.S. and Mexico to the Class I railroads serving eastern Canada and northeastern and southeastern U.S.
- Neither CSX Transportation (CSXT) nor Norfolk Southern (NS) directly serves Wisconsin. These two railroads are the principal providers of freight rail service east of the Mississippi River. Wisconsin freight traffic carried by either railroad must be interchanged in Chicago.
- Large railways strongly favor dedicated trainload movement of international container traffic and seldom promote locations that are not capable of loading an entire train for movement to a single port.
- The southern part of Wisconsin is in close proximity to about 20 truck-rail intermodal facilities in northeastern and north central Illinois. Because Chicago is the major interchange location for all of North America's Class I railroads, the Class I railroads operate multiple intermodal facilities in Northeast Illinois.
- The northwestern part of Wisconsin is in close proximity to two truck-rail intermodal facilities located in the Minneapolis-St. Paul metropolitan area.

[50] Chippewa Herald, "Chippewa Falls rail terminal opens world markets to area businesses." (January 27, 2016).
[51] WQOW, "Long grain headed overseas thanks to new facility in Chippewa Falls." (September 27, 2013).

Because of these factors, Wisconsin shippers seeking access to long-haul intermodal service for export must move their commodities by truck across state lines to freight-rail intermodal facilities that have dedicated service to and from major U.S. ports. Many shipments with origins or destinations in Wisconsin are currently trucked to the intermodal facilities located in either northeast Illinois or the Twin Cities in Minnesota.

Wisconsin's Transload Facilities

Over the past decade, transload facility – sites where non-containerized goods are transferred between modes, typically truck-rail or rail-barge – usage has increased in Wisconsin. There are over 100 transload facilities interspersed throughout the state. Many of these facilities are large, privately operated warehouse structures, with docks for rail cars and semi-trailers. Some of these facilities are climate-controlled, offering refrigerated and/or freezer storage. Other facilities use covered or uncovered outdoor locations to hold bulk loads such as sand, stone, and salt. Still others feature specialized storage/transfer areas, such as cement and grain towers.

5.5 Wisconsin's Airports

Wisconsin businesses use air freight to ensure the availability and freshness of products with short shelf lives to aid in just-in-time manufacturing and expand market reach. In 2013, almost 105,000 tons of air freight cargo was shipped via planes, with a total value exceeding $10 billion.[52] Wisconsin has six airports offering regular air cargo service, shown in Figure 5-13:

- Appleton International, Appleton
- Austin Straubel International, Green Bay
- Dane County Regional, Madison
- General Mitchell International, Milwaukee
- Central Wisconsin, Mosinee
- Rhinelander-Oneida County, Rhinelander

Wisconsin's Air Freight/Cargo

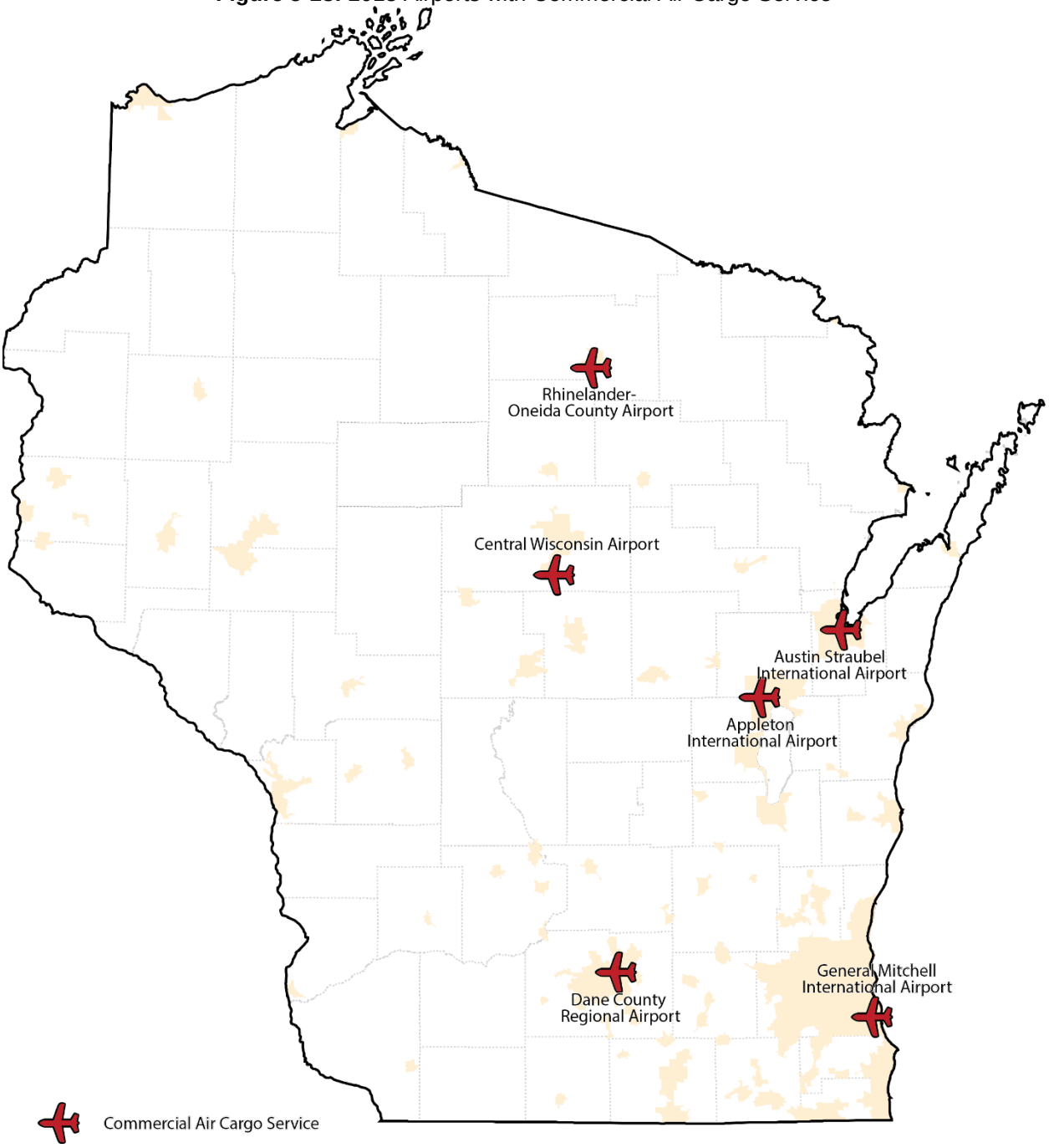
- Six airports provide regular air cargo services
- In 2013, almost 105,000 tons of cargo was shipped via planes with a total value of exceeding $10 billion

Cargo that moves by air tends to be items that are high-value, low weight/bulk, time-sensitive or highly specialized. The most common commodity types include small packaged freight, transportation equipment, electrical equipment, machinery, instruments, photo equipment, optical equipment, miscellaneous manufacturing products, and chemicals and allied products.[53]

General Mitchell International Airport (GMIA) in Milwaukee is Wisconsin's dominant air cargo airport, handling approximately 70 percent of the state's total air cargo in 2013.[54] GMIA also serves as a hub for air cargo shipments from other parts of the state. Nearly all of the remaining 30 percent of air cargo moved in the state is routed through Madison and Appleton.[55]

[52] 2013 IHS Transearch Database.
[53] 2013 IHS Transearch Database, 2 digit STCC Codes used.
[54] Wisconsin Department of Transportation, Bureau of Aeronautics.
[55] Ibid.

Figure 5-13: 2013 Airports with Commercial Air Cargo Service



Source: Wisconsin Department of Transportation, Bureau of Planning and Economic Development

Express carriers also use feeder services originating at seven other public airports in Wisconsin. Rather than maintain and operate a fleet of small aircraft, the integrated express carriers contract for on-demand service with a variety of aircraft operators. Contracted feeder services are provided from the following airports:

- Baraboo-Wisconsin Dells, Baraboo
- Rice Lake Regional-Carl's Field, Cameron
- Chippewa Valley Regional, Eau Claire
- Rock County, Janesville
- La Crosse Municipal, La Crosse
- Menomonie Municipal-Score Field, Menomonie
- Iowa County, Mineral Point

5.6 Wisconsin's Ports, Waterways, and Ferries

In 2013, more than 28 million tons, or approximately five percent of Wisconsin's freight by weight, worth over $2 billion (less than one percent of the total state freight value) was transported by and through ports and waterway facilities.[56]

The primary commodities at Wisconsin ports by weight included coal, metallic ores, nonmetallic minerals, and clay, concrete, glass, and stone. Other important products include petroleum and coal products, heavy machinery, bagged and canned cargo, wind energy components, and other goods.[57]

Water transportation is the most efficient method for moving bulk commodities. A Great Lakes freighter can move a ton of freight approximately 607 miles on one gallon of fuel. In contrast, a freight train travels only 202 miles on one gallon of fuel per ton of cargo and a truck travels a mere 59 miles on one gallon of fuel per ton of cargo.[58]

Wisconsin is directly connected to two major waterway systems: the Great Lakes Navigation System and the Upper Mississippi River System.

Wisconsin's Ports, Waterways and Ferries

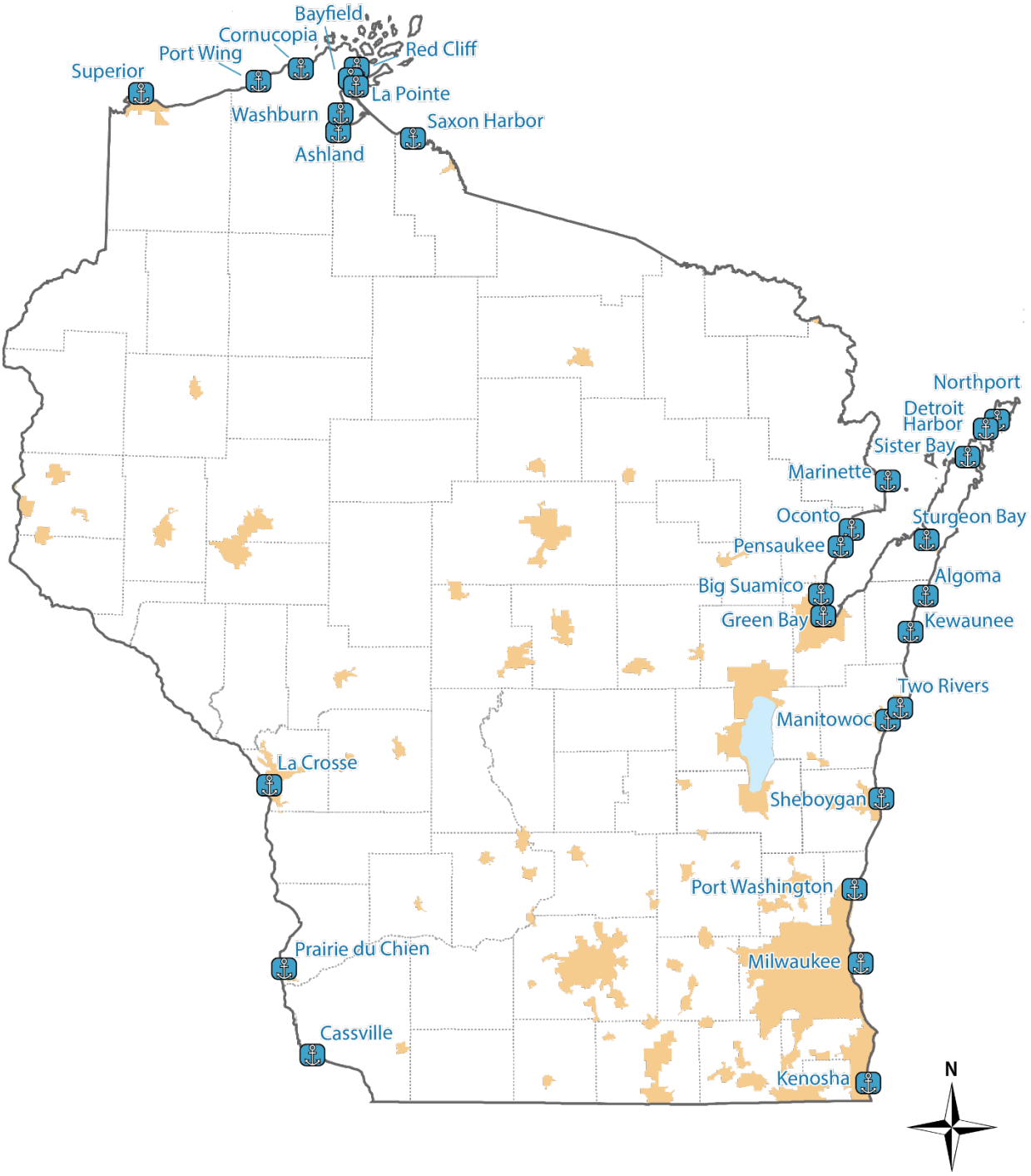
- Gateway ports include: Milwaukee, Green Bay, Marinette, Duluth-Superior, La Crosse, and Prairie du Chien
- Diversified Cargo Ports: Marinette – Menominee and Manitowoc
- Limited Cargo Ports: Ashland, Bayfield, Washburn, Port Washington, Sturgeon Bay, and Washington Island
- More than 28 million tons of cargo, worth over $2 billion was shipped to and from Wisconsin's ports in 2013
- International connections through the St. Lawrence Seaway via the Great Lakes
- The Mississippi River provides access to the Gulf of Mexico
- Many ports provide intermodal connections to rail

Wisconsin Ports

Using WisDOT's eligibility criteria from the Harbor Assistance Program,[59] there are 29 commercial ports in Wisconsin (Figure 5-14).

[56] 2013 IHS Transearch Database.
[57] 2013 IHS Transearch Database; individual Wisconsin ports' officials.
[58] U.S. Army Corps of Engineers, "Great Lakes Navigation System: Economic Strength." (2009).
[59] Wisconsin Department of Transportation, Bureau of Transit, Local Roads, Railroads and Harbors.

Figure 5-14: 2015 Commercial Ports in Wisconsin



Source: Wisconsin Department of Transportation, Bureau of Planning and Economic Development

As shown in Table 5-12, Wisconsin's ports vary substantially in size of operation, volumes and the types of cargo handled. The twin ports of Duluth-Superior dominate the Great Lakes for the volume of cargo, due to the large quantities of western coal, northern Minnesota iron ore, and Upper Great Plains grain they handle. These bulk commodities are shipped through the twin ports to other destinations along the Great Lakes and overseas. Between 2010 and 2014, the twin ports combined averaged almost 38 million tons of transported cargo per year; 86 percent of which was outbound.[60] Milwaukee and Green Bay comprise the next tier of ports based on tonnage amounts. These facilities also move bulk goods, but between 2010 and 2014, 95 percent of each port's freight was inbound.[61]

Table 5-12: Cargo at Wisconsin's Major Commercial Ports

Port	Volume in Short Tons* (Year Reported)	Cargo Types[62]
Duluth-Superior	37,552,802[63] - (2014)**	Asphalt, calcium chloride, cement, coal, concrete, dry bulk, general cargo/break bulk, fertilizer, finished steel, forest products, grain, iron ore, limestone, liquid bulk, salt, scrap iron and metals, slag, steel coil, stone and aggregate, wind turbine components, wood products, and other heavy equipment for energy-related projects
Green Bay	2,543,414[64] - (2014)	Cement, coal, gypsum, limestone, liquid asphalt, miscellaneous bulk, petroleum coke, petroleum products, salt, sand, and pig iron
La Crosse	757,500[65] - (2014)	Caustic soda, cement, coal, highway construction materials, cottonseed, dried distillers grain, fertilizer, finished goods, other grains, gypsum, pig iron, potash, and salt
Manitowoc	296,424[66] - (2014)	Cement, coal, flexible pipe for oil and gas mining, newly constructed yachts, passenger and commercial vehicles, rock, stone, wind turbine towers and parts, and wood
Marinette	203,606[67] - (2013)***	Limestone, pig iron, road salt, and high-tech vessels
Milwaukee	3,331,909[68] - (2014)	Asphalt, cement, coal, fertilizer, general cargo, grain, out-of-gauge machinery, limestone, vehicles, salt, scrap metal, steel, and wind energy components
Prairie du Chien	380,170[69] - (2013)	Corn, soybeans, dried distillers grain, scrap metal, and wheat
Sturgeon Bay	35,017[70] - (2013)	Cement, coal, concrete, iron and steel products, vessels under construction or repair, and waterway improvement materials

Source: Wisconsin Department of Transportation, Bureau of Planning and Economic Development

** Tonnage is in short tons. A short ton is equal to 2,000 pounds (907.18474 kilograms) and is often called a "ton" without distinguishing it from the metric ton (1,000 kilograms).*

*** Includes Duluth, MN tonnage*

**** Includes Menominee, MI tonnage*

[60] Duluth Seaway Port Authority.
[61] Wisconsin Department of Transportation, Bureau of Planning and Economic Development.
[62] 2013-2014 data from individual port officials.
[63] Port of Duluth Superior, 2015.
[64] Port of Green Bay, 2015.
[65] Brennan Marine, Inc., 2015.
[66] City of Manitowoc, Engineering Department, 2015.
[67] U.S. Army Corps of Engineers.
[68] Port of Milwaukee, 2015.
[69] Prairie Sand and Gravel, Inc., 2014.
[70] U.S. Army Corps of Engineers.

Wisconsin Commercial Ports Development Initiative
In 2013, the Wisconsin Commercial Ports Association began development of a statewide strategic plan to support increased freight movement and logistics development for Wisconsin's commercial ports. WisDOT and other state agencies have supported this planning effort with staff time, data, and financial contributions. Phase I of the initiative developed a strategic plan, infrastructure and market inventory, and planning review. Phase II identified and developed port market scenarios. Together, the two phases outline the assets and importance of Wisconsin's ports and waterways, define strategies to increase the movement of freight through Wisconsin's ports to drive economic development and identify market scenarios where shipping costs could be reduced. WisDOT has identified a need for a maritime strategy, outlined in Chapter 8, *Freight Policies and Strategies*. Additional information on port assets and strategies can be found in Phase 1[71] and Phase 2[72] reports.

Wisconsin's port facilities serve as multimodal distribution centers linking waterborne vessels (ships and barges) with an extensive network of highways, railroads, and airports. As centers of economic activity, Wisconsin's ports and harbors include the operations of local and municipal government agencies; federal agencies such as the Coast Guard and United States Army Corps of Engineers (USACE); and private companies that contract with these agencies.

Businesses that are attracted to a region because of the presence of a port are not always located at the port itself. These companies typically fall into two groups: exporters of commodities and importers of raw materials for assembly or distribution. The presence of a port can also benefit other industries by providing export options that extend their market reach.

Wisconsin's Waterway Connections

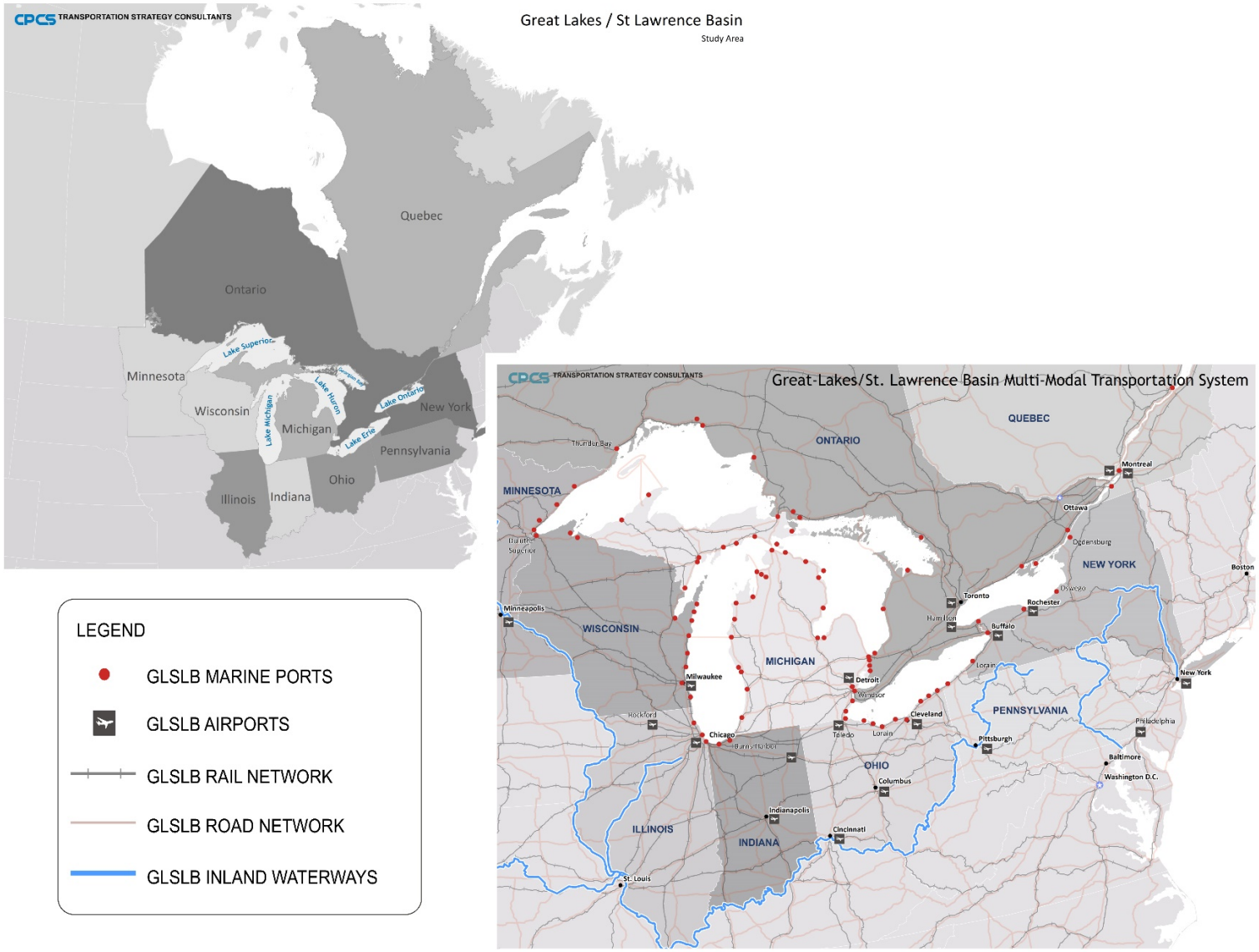
The following waterways provide Wisconsin businesses access to regional, national, and international destinations.

Great Lakes Navigation System

The Great Lakes Navigation System (GLNS) is a continuous 27-foot deep draft waterway that extends from the western end of Lake Superior at Duluth, Minnesota, to the Gulf of St. Lawrence on the Atlantic Ocean, a distance of over 2,400 miles.[73] As shown in Figure 5-15, this bi-national resource is comprised of the five Great Lakes, the connecting channels of the Great Lakes, the St. Lawrence River, and the Gulf of St. Lawrence. The United States portion of the system includes 140 harbors (60 commercial; 80 recreational), two operational locks, 104 miles of breakwaters and jetties, and over 600 miles of maintained navigation channels.[74] In addition, the GLNS is connected to several other shallow-draft waterways (Illinois Waterway, New York State Barge Canal, etc.) to form an important waterborne transportation network, reaching deep into the continent.

[71] National Center for Freight & Infrastructure Research & Education, "Wisconsin Commercial Ports Development Initiative." (December 2014).
[72] National Center for Freight & Infrastructure Research & Education, "Leveraging our Comparative Advantage, Phase II: Identification and Development of Wisconsin Port Market Scenarios." (October 2016).
[73] U.S. Army Corps of Engineers, "Great Lakes Navigation System."
[74] Ibid.

Figure 5-15: Great Lakes and St. Lawrence Basin (GLSLB) Transportation System



Source: CPCS Analysis developed for NCFRP Report 17: Multimodal Freight Transportation Within the Great Lakes–Saint Lawrence Basin

Upper Mississippi River System

The Upper Mississippi River System is a 1,300-mile waterway extending from Minnesota to Illinois, linking Wisconsin, Minnesota, Iowa, Illinois, and Missouri to the lower Mississippi River and to the import/export facilities of the Gulf Coast. From 2009 to 2013, an annual average of 107 million tons of cargo was transported between Minneapolis and the mouth of the Ohio River (near the southern tip of Illinois).[75]

Age of Upper Mississippi River Infrastructure

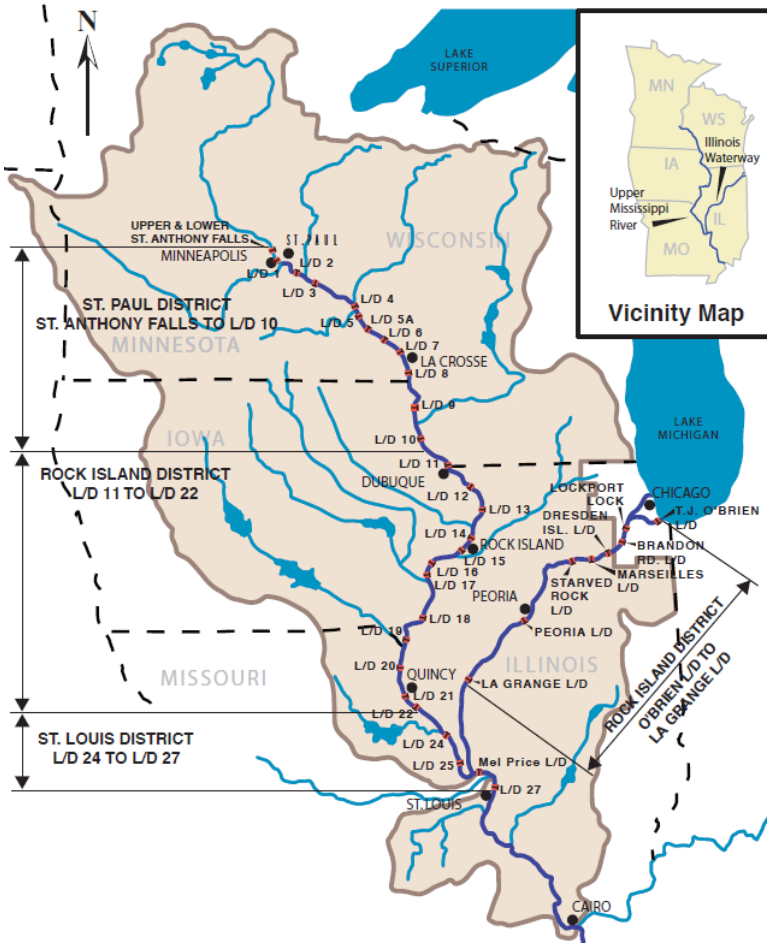
The current nine-foot channel lock and dam system was built in the 1930s with an estimated lifespan of 50 years. The structures have long outlived their life expectancy but continue to operate.

USACE maintains a nine-foot navigation channel on the Upper Mississippi River and builds breakwaters or jetties to protect public property from shoreline erosion. Channels with navigation depths of less than nine feet require barges to carry less cargo or "light load," which increases the cost per ton-mile and reduces commercial river freight's cost-effective advantage. Sedimentation in the channel is caused by the normal cycle of silt movement, erosion from high water or heavy rains and changes in river currents. To maintain the nine-foot navigation channel, material that settles in the channel area must be removed via mechanical or hydraulic dredging methods. Unfortunately, many of these navigational channels cannot be dredged as often as recommended by USACE due to a lack of funding or environmental constraints, which contributes to travel delays, decreased reliability, and increased cost.

Twenty-nine locks and dams and a nine-foot navigation channel accommodate the safe and efficient movement of barge and recreational boat traffic along the approximately 670 miles of the Upper Mississippi River between Minneapolis-St. Paul in Minnesota and St. Louis in Missouri (Figure 5-16).[76] Locks and dams allow river vessels to "step" up or down the river from one water level to another. Additional benefits from the locks and dams include adding river recreational areas for public use, providing a water supply for several river communities, and serving as nesting grounds for migratory birds.

[75] U.S. Army Corps of Engineers, "Waterborne Commerce of the United States, Calendar Year 2013, Part 2–Waterways and Harbors, Gulf Coast, Mississippi River System and Antilles."
[76] Upper Mississippi River Basin Association, "River and Basin Facts."

Figure 5-16: Upper Mississippi River Locks and Dams



Source: U.S. Army Corps of Engineers

Location of Mississippi River Locks and Dams

Wisconsin-Minnesota Border

- Lock and Dam No. 3 – Red Wing, MN
- Lock and Dam No. 4 – Alma, WI
- Lock and Dam No. 5 – Winona County, MN
- Lock and Dam No. 5A – Fountain City, WI
- Lock and Dam No. 6 – Trempealeau, WI
- Lock and Dam No. 7 – La Crescent, MN
- Lock and Dam No. 8 – Genoa, WI

Wisconsin-Iowa Border

- Lock and Dam No. 9 – Lynxville, WI
- Lock and Dam No. 10 – Guttenberg, IA
- Lock and Dam No. 11 – Dubuque, IA

5.7 Wisconsin's Pipelines

Wisconsin is not a producer of natural gas or crude oil, but it relies on natural gas and refined petroleum products to fuel economic activity. Wisconsin's privately-owned pipeline system is used primarily for the transmission and distribution of natural gas, petroleum products, and to move crude oil through the state. Wisconsin's over 74,800 miles of pipelines transported more than 29 million tons of natural gas and petroleum products, valued at almost $16 billion in 2012.[78] Table 5-13 displays the distribution of mileage in Wisconsin based on the type of commodity transported.

Wisconsin's Pipelines
• Over 74,800 miles of pipelines • Carry more than 29 million tons of natural gas and petroleum products, valued at almost $16 billion in 2012[77]

Table 5-13: Total Wisconsin Pipeline Miles by Type

Commodity/Pipeline Type	Miles	Percent of the Total
Natural Gas	**72,377**	**97%**
Natural Gas Mainline Distribution Pipelines	38,419	51%
Natural Gas Transmission Pipelines	4,482	6%
National Gas Service Distribution Pipelines	29,476	39%
Petroleum Liquids	**2,455**	**3%**
Crude Oil Pipelines	1,181	2%
Petroleum Product (non-HVL) Pipelines	1,036	1%
Highly Volatile Liquids (HVL)* Pipelines	238	0%
Total	**74,832**	**100%**

**HVLs include ethane, ethylene, propane, propylene, butylene, and anhydrous ammonia*

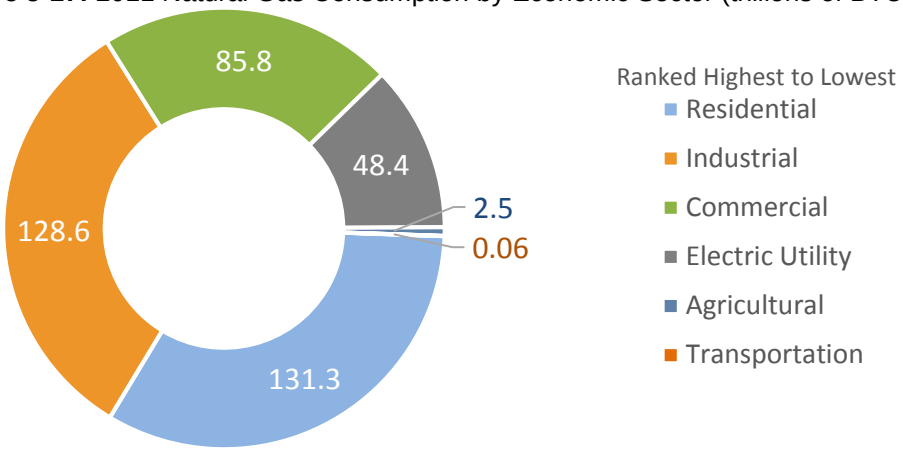
Source: CPCS, "Wisconsin State Freight Plan - Wisconsin Pipelines: Draft Final Report." (February 2016).

Pipeline commodities are a key economic input into Wisconsin's economy. Pipelines are the preferred method to transport large volumes of liquids and gases over longer distances, due in part to lower costs relative to rail or trucking. Commodities transported via Wisconsin pipelines (e.g., crude oil, natural gas, propane, gasoline, fuel oil, and petroleum products) are key inputs for transportation, commercial and residential heating, energy production, manufacturing, refining, petroleum-derived products, and agricultural sectors.

Figure 5-17 displays the breakdown of natural gas and petroleum use in Wisconsin by sector. Wisconsin residents are heavily dependent on natural gas for heating, with 70 percent of all residents relying on it as their heat source.[79] While residential is a significant consumer of natural gas, industrial, commercial, and electric sectors are also heavy users, demonstrating the economic importance of pipelines to these sectors.

[77] CPCS, "Wisconsin State Freight Plan - Wisconsin Pipelines: Draft Final Report." (February 2016).
[78] Ibid.
[79] U.S. Energy Information Administration, "Household Energy Use in Wisconsin." (2009).

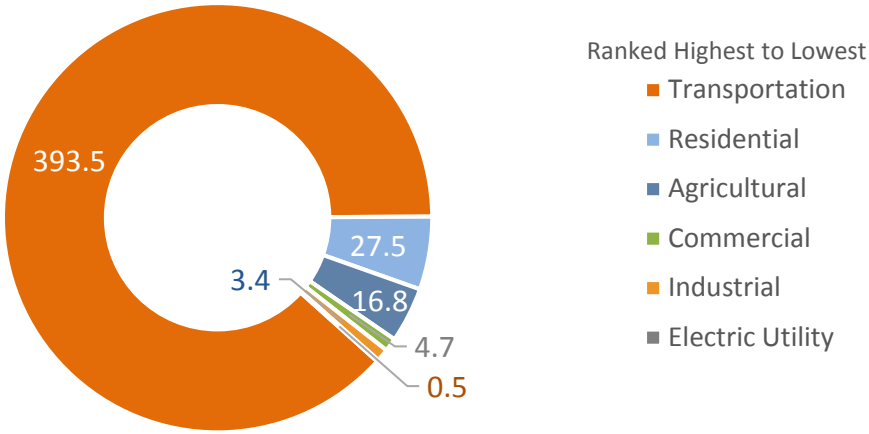
Figure 5-17: 2011 Natural Gas Consumption by Economic Sector (trillions of BTU)



Source: CPCS, "Wisconsin State Freight Plan - Wisconsin Pipelines: Draft Final Report." (February 2016).

Figure 5-18 displays petroleum consumption heavily concentrated in the transportation sector. Petroleum is not used in commercial and industrial applications to the same degree as natural gas.

Figure 5-18: 2011 Petroleum Consumption by Economic Sector (trillions of BTU)



Source: CPCS, "Wisconsin State Freight Plan - Wisconsin Pipelines: Draft Final Report." (February 2016).

United States Pipeline Transportation System

The nation's pipelines are also a critical component of the country's transportation system. Pipelines enable the safe movement of extraordinary quantities of energy products to industry and consumers, literally fueling the economy and way of life. The pipelines are the arteries of the nation's energy infrastructure, as well as one of the safest and least costly ways to transport energy products. United States oil and gas pipelines provide the resources needed for national defense, household heating and cooling, and power generation for business and fuel.

Almost three million miles of pipelines safely deliver trillions of cubic feet of natural gas and hundreds of billions of ton/miles of liquid petroleum products each year.[80] Pipelines are essential as the volume of energy products they move are well beyond the capacity of other forms of transportation. It would take a constant line of tanker trucks, about 750 per day, loading up and moving out every two minutes, 24 hours a day, seven days a week, to move the

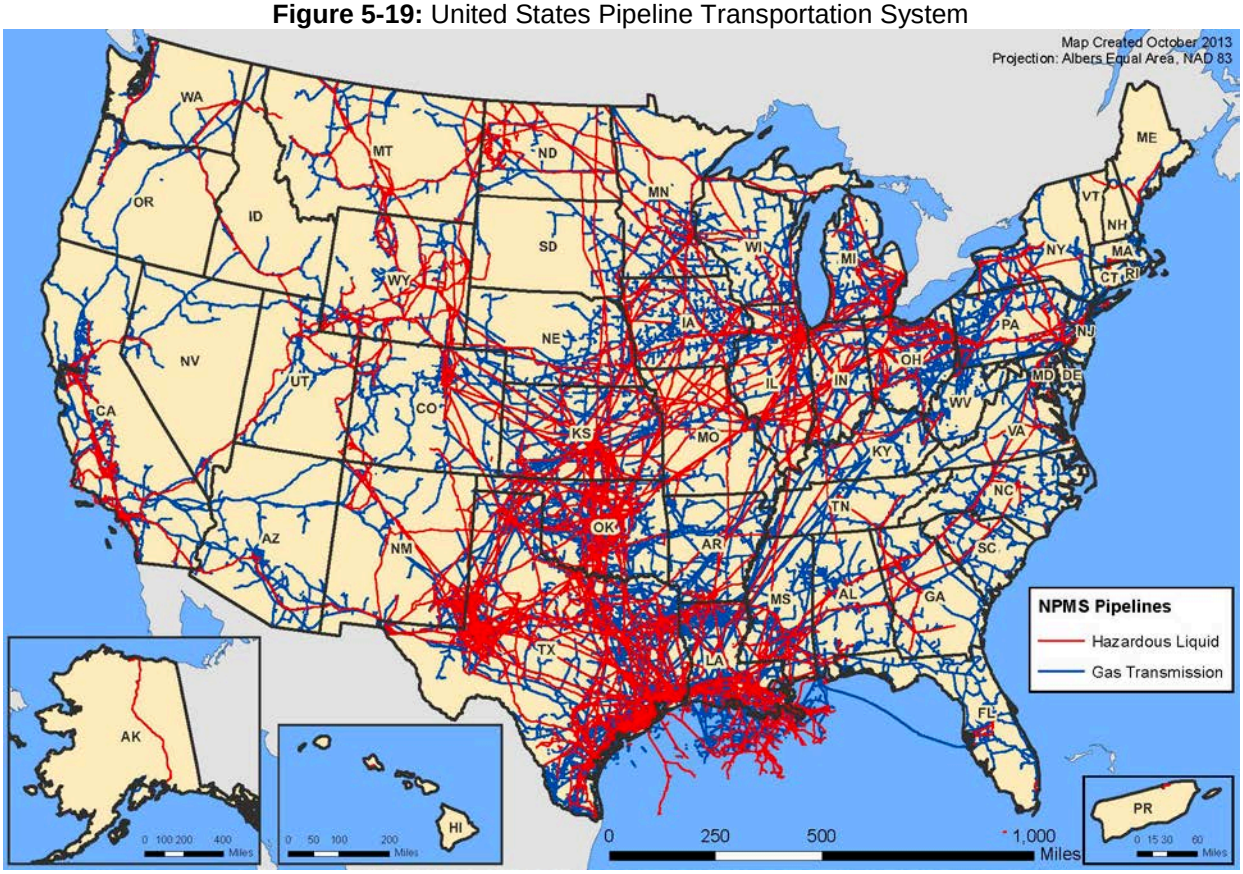
[80] CPCS, "Wisconsin State Freight Plan - Wisconsin Pipelines: Draft Final Report." (February 2016).

volume of even a modest pipeline. The railroad-equivalent of this single pipeline would be a train of 75 2,000-barrel tank rail cars every day.[81]

As identified in Chapter 2, *Transportation Stakeholders and Institutions*, the federal authority for pipeline safety is the Pipeline and Hazardous Materials Safety Administration (PHMSA) of the United States DOT. PHMSA's Office of Pipeline Safety is responsible for regulating the safety of design, construction, testing, operation, maintenance, and emergency response of United States oil and natural gas pipeline facilities.

Figure 5-19 identifies the over two million miles of pipelines in the United States carrying natural gas and hazardous liquids (chiefly petroleum and refined petroleum products, as well as chemicals and hydrogen).

Figure 5-19: United States Pipeline Transportation System



Source: U.S. Department Of Transportation

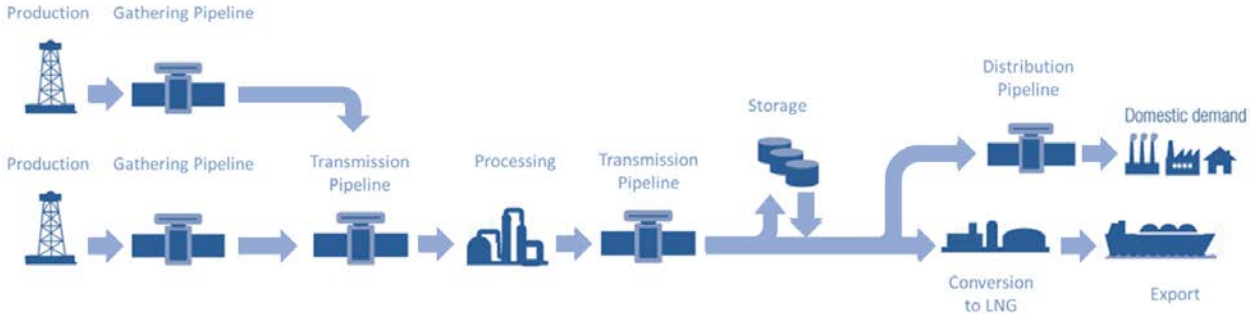
Natural Gas Pipelines

Natural gas is transported almost exclusively by pipeline. Natural gas utilizes a very extensive network of pipelines of diminishing size, pressure, and capacity as the gas approaches the final consumer. There are an estimated two and a half million miles of underground natural gas pipelines in the nation.[82] As a consumer rather than producer of natural gas, Wisconsin relies on transmission and distribution lines to receive natural gas. Figure 5-20 shows the

[81] Pipeline and Hazardous Materials Safety Administration, "General Pipeline FAQs."
[82] CPCS, "Wisconsin State Freight Plan - Wisconsin Pipelines: Draft Final Report." (February 2016).

role of transmission lines bringing natural gas to processing facilities and eventually to distribution lines that feed users of natural gas.

Figure 5-20: Role of Each Pipeline Type in the Natural Gas Supply Chain



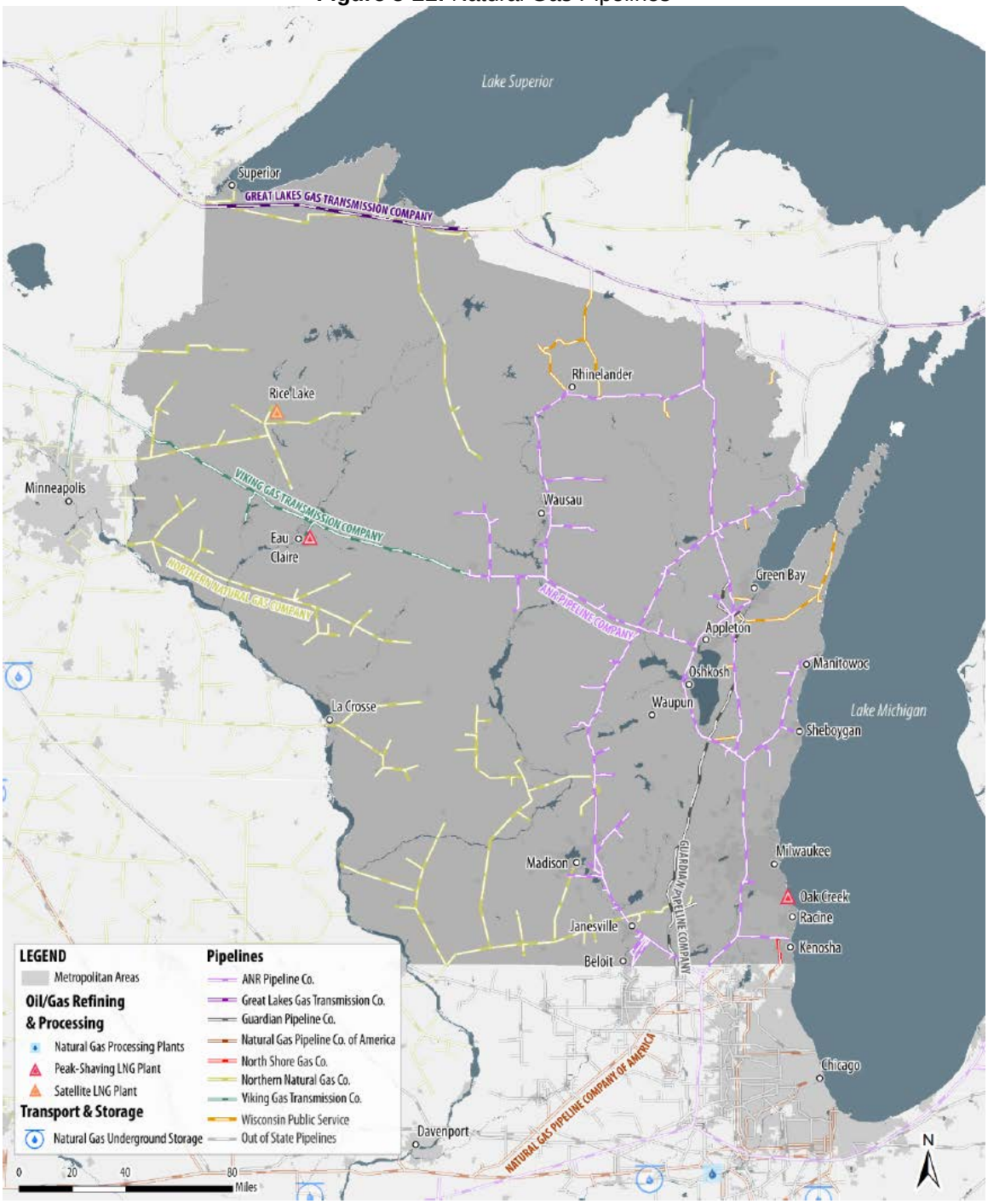
Source: CPCS

The United States has been at the center of increased production of natural gas over the past ten years following the increased use of hydraulic fracturing to extract oil and natural gas from shale formations. Even though Wisconsin does not produce oil or natural gas, the state is affected by domestic production trends. The total number of natural gas customers in Wisconsin has increased steadily over time. The proportion of residential relative to commercial and industrial users has stayed relatively stable over time, with residential consumption comprising about 91 percent of all customers. In terms of total consumption, residential users consumed an average of 34 percent of all natural gas from 1995-2012.[83] Consumption varies significantly year to year, based partially on the temperatures during winter. Additionally, Wisconsin has continued to increase both the capacity and the proportion of electricity generated from natural gas.

[83] CPCS, "Wisconsin State Freight Plan - Wisconsin Pipelines: Draft Final Report." (February 2016).

Figure 5-21 displays Wisconsin's natural gas transmission lines, which bring natural gas into the state for consumption.

Figure 5-21: Natural Gas Pipelines



Source: CPCS

Crude Oil Pipelines

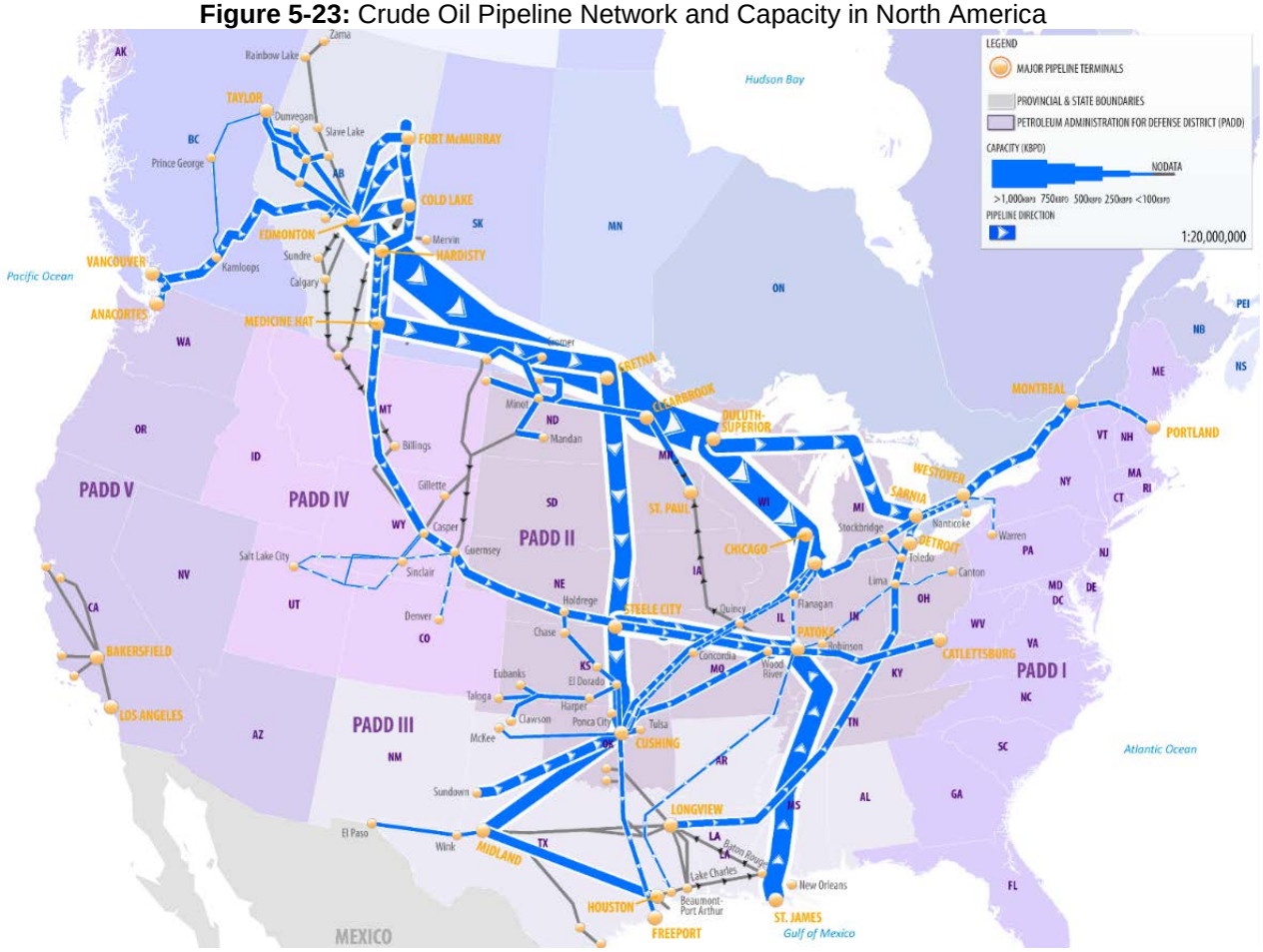
Enbridge Energy is the sole operator of crude oil pipelines in Wisconsin. Figure 5-22 displays Enbridge's United States Mainline or Lakehead System, which is comprised of a series of pipelines that moves crude oil from Canada and North Dakota to Minnesota, Wisconsin, Illinois, Indiana, Michigan, and New York. The United States Mainline connects with various refineries along its route, including Wisconsin's sole refinery in Superior.

Figure 5-22: Wisconsin's Crude Oil Pipelines

Source: CPCS

Figure 5-23 and Figure 5-24 display Wisconsin within the national context for the production and flow of crude oil. Figure 5-23 displays Wisconsin's role as a pass-through state for crude oil; the majority of crude oil entering the state passes through without stopping. Enbridge Energy's Lakehead pipeline travels through Wisconsin, delivering crude oil to the Calumet Superior Refinery in Superior on its way to refineries in Illinois, Indiana, and Minnesota.

Figure 5-23: Crude Oil Pipeline Network and Capacity in North America



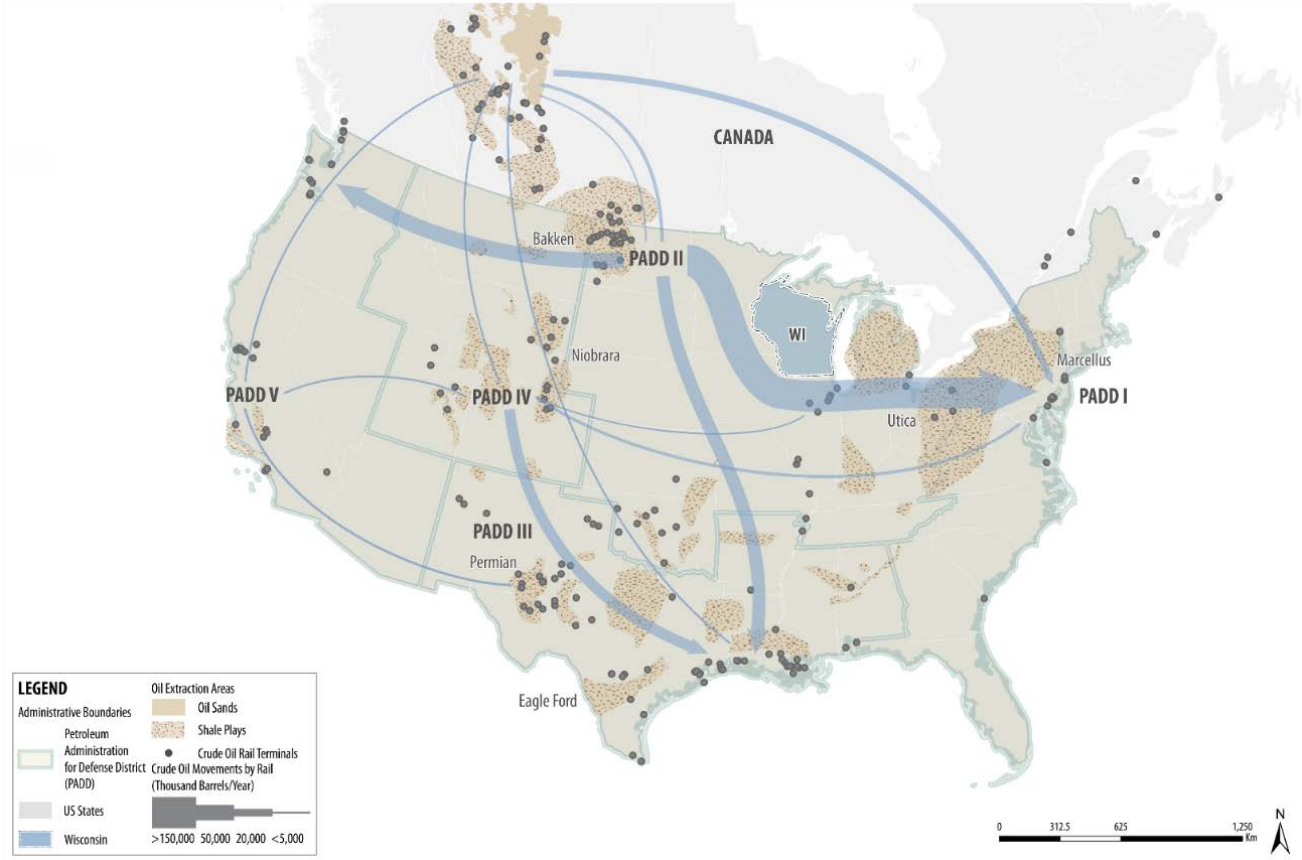
Source: CPCS

Additionally, Wisconsin's rail system is impacted by crude oil flows when the origin or destination of crude oil is not connected to a pipeline, showing how pipelines impact other modes of transportation. Figure 5-24 displays crude oil by rail volumes, including flows from Texas (Eagle Ford and Permian), Colorado (Niobrara), North Dakota (Bakken), and Canada (oil sands and northern extent of the Bakken). The largest flows are from PADD II to PADD I, i.e. flows that originate in the Bakken shale and are destined for East Coast refineries. According to United States Energy Information Administration (EIA) data, these flows averaged roughly 400,000 barrels per day in 2015, or approximately six unit trains per day.[84,85] These flows would impact Wisconsin, as they would be routed over the

[84] U.S. Energy Information Administration, "Movements of Crude Oil and Selected Products by Rail between PAD Districts."
[85] This conversion is based on approximately 60,000 barrels per train. Cairns notes that "CP has found that crude from the Bakken shale deposit is moved with 600 to 650 barrels per tank car." Assuming an average train length of 100 cars results in approximately 60,000 to 65,000 barrels per train. The estimate developed using this methodology corresponds well with information gathered by the Wall Street Journal in December 2014, which found that approximately 38 crude oil trains per

BNSF and CP lines through the state. Flows from Canada to PADD I and II, and intra-PADD-II flows could also flow through Wisconsin, though these flows are much smaller than the PADD II to I flows.

Figure 5-24: 2015 Crude Oil by Rail Movements in the United States



Source: CPCS

Petroleum Product Pipelines

Refined from crude, petroleum products are key to fueling the Wisconsin economy. Refined petroleum products utilize terminals throughout the state to store and distribute their products. Terminals have geographic coverage over much of the state, but tend to cluster around population centers and places where petroleum product pipelines converge (see Figure 5-25).

Wisconsin is served by a number of petroleum product pipelines. PHMSA identifies petroleum products as either highly volatile liquids (HVL)[86] or non-HVL petroleum products. Table 5-14 displays the operators, commodity type carried, and the total number of miles of Wisconsin's petroleum pipelines. Enbridge Energy and Koch Pipeline Company are the two largest operators of HVL and non-HVL petroleum product pipelines in Wisconsin.

week pass through Wisconsin on BNSF and CP lines. Cairns, M. 2013. Crude Oil by Rail: Part II: Potential for the Movement of Alberta Oil Sands Crude Oil and Related Products by Canadian Railways. Presentation to the Canadian Transportation Research Forum.

[86] HVLs are liquids that undertake a gaseous form when they are at atmospheric pressure and temperature; examples include ethane, ethylene, propane, propylene, butylene, and anhydrous ammonia.

Table 5-14: Wisconsin Petroleum Product Pipeline Operators by Commodity and Mileage

Operator	Commodity Type	Miles
Total Hazardous Liquid Pipelines	**HVL**	**238**
Koch Pipeline Company	HVL	154
Enbridge Energy	HVL	13
Enterprise Products Operating	HVL	71
Total Petroleum Products Pipelines	**Petroleum Products**	**1,036**
Koch Pipeline Company	Petroleum Products	363
Enbridge Pipelines (Southern Lights)	Petroleum Products	358
West Shore Pipeline Co	Petroleum Products	213
Magellan Pipeline Company	Petroleum Products	94
Calumet Superior	Petroleum Products	6
Shell Pipeline Co.	Petroleum Products	2
Total	**All Commodities**	**2,455**

Source: CPCS, "Wisconsin State Freight Plan - Wisconsin Pipelines: Draft Final Report." (February 2016).

Wisconsin is fortunate to be near a number of large refineries in Illinois, Indiana, and Minnesota with direct pipeline connections to Wisconsin. Table 5-15 displays Midwestern refineries, their location and their overall refining capacity.

Table 5-15: Midwest Refineries Supplying Wisconsin with Petroleum Products

Refinery Name	Location	Processing Capacity
BP	Whiting, IN	413,000
Flint Hills / Koch	Rosemount, MN	339,000
ExxonMobil	Joliet, IL	250,000
PDV / Citgo	Lemont, IL	180,000
Northern Tier	St Paul, MN	90,000
Calumet	Superior, WI	45,000

Source: CPCS, "Wisconsin State Freight Plan - Wisconsin Pipelines: Draft Final Report." (February 2016).

Each pipeline in Figure 5-25 provides a connection to products refined throughout the United States. Furthermore, each pipeline serves various parts of Wisconsin along its path. The following provides an overview of Wisconsin's petroleum product pipelines and the connections along their route.

West Shore Pipeline: West Short Pipeline is a stock company owned by Buckeye, Shell, Citgo, Sunoco Logistics, and ExxonMobil. West Shore receives refined products from Citgo, BP, and ExxonMobil, as well as from the Explorer Pipeline, which connects West Shore to refiners in Houston. Explorer is also a stock company owned by Marathon, Shell, Phillips66, and Sunoco Logistics. Following an initial closure in March 2016, in April 2017 the company informed Wisconsin officials that the West Shore Pipeline between Milwaukee and Green Bay would be permanently shut down and would not be replaced.[87]

Koch Pipeline: The Koch Pipeline is owned by Flint Hills Resources and accesses both the Pine Bend refinery and the Flint Hills terminals in Waupun, Milwaukee, and Madison. The pipeline transports propane from the Minnesota

[87] Milwaukee Journal Sentinel, "Company won't replace only fuel pipeline to Green Bay." (April 21, 2017).

border to the Junction City Terminal. Koch also has another pipeline in the same area that transports refined products from Minnesota to Junction City then onto Waupun, Milwaukee, and McFarland terminals.

Enbridge Pipeline (Southern Lights): The Enbridge Southern Lights pipeline, which came into service in 2010, extends from its origin in Chicago to Edmonton, Alberta. The Southern Lights pipeline has a capacity of 180,000 barrels per day and delivers diluent to Alberta for use in moving heavy Canadian crude oil.[88]

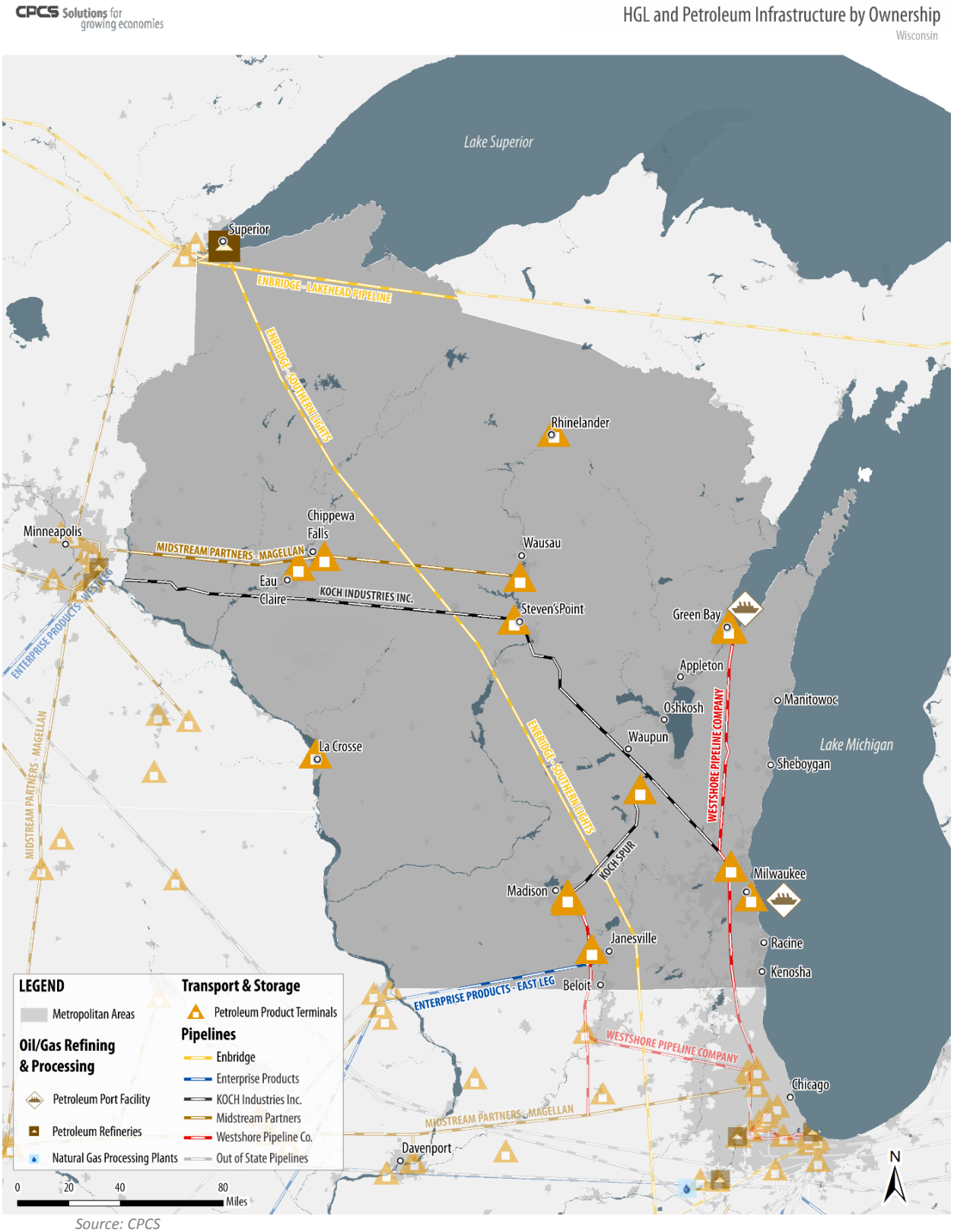
Enbridge Pipeline (Lakehead Line 5): The Enbridge Lakehead Line 5 has a capacity of 540,000 barrels per day, moving Natural Gas Liquids (NGL) and light crude from Superior to Sarnia, Ontario.[89]

Magellan Pipeline: The Magellan Pipeline connects Minnesota's Northern Tier Refinery to Wisconsin to market petroleum products they do not sell through the company-operated SuperAmerica convenience stores. Northern Tier supplies the majority of Marathon fuels in Wisconsin.[90]

Enterprise Products East Leg: The Enterprise Products pipeline transports propane from Conway, Kansas and delivers products to terminals near Janesville.

[88] Alberta Infrastructure and Transportation, "Capital Region Integrated Growth Management Plan Final Report on Core Infrastructure."
[89] Enbridge, "2016 Economic Impact and Benefits in the State of Wisconsin."
[90] Note that though the Magellan pipeline is operable to Wausau, the pipeline ends operation at Chippewa Falls' terminals and is filled with nitrogen from Chippewa Falls to Wausau. Nitrogen is used to protect the integrity of the pipeline while not in use.

Figure 5-25: Petroleum Product Pipelines and Terminals



Source: CPCS

Other Pipeline Assets

The other pipeline assets in Wisconsin that are relevant to other modes of transportation include a refinery in Superior, Wisconsin and the petroleum product terminals throughout the state.

The Calumet Superior refinery, located in Superior, has a capacity of 45,000 barrels per day, producing gasoline, diesel, asphalt, and heavy fuel. The refinery receives its crude by pipeline (Enbridge) and rail car. The products from the refinery are delivered via the Magellan pipeline, tank truck, and rail car.[91] The Calumet Superior refinery has not had an accident in the last five years and disruption in the refineries function is most often due to a loss in power, maintenance or other causes.

Wisconsin relies on petroleum product terminals to serve as the connection between pipelines and the end consumer of the petroleum product. Product terminals also enable modal interchange between pipeline, roadway, water, and rail. Figure 5-25 shows the location and Table 5-16 notes the products they store and the pipelines connected to each terminal. Wisconsin's terminals are concentrated in areas with a significant population. As expected, the majority of terminals focus on providing transportation fuels such as ultra-low sulfur diesel (ULSD), gasoline, and aviation gas or jet fuel. Other products include propane, fuel oil, conventional blendstock for oxygenate blending (CBOB), and reformulated gasoline blendstock for oxygenate blending (RBOB).

[91] Calumet Specialty Products Partners, L.P., "Calumet Superior Refining - Superior, Wisconsin."

Table 5-16: Petroleum Product Terminals

Wisconsin City	Terminal Operators	Products	Access
Chippewa Falls	**US Oil**	**ULSD, Gasoline**	**Pipeline and Truck**
Chippewa Falls	US Oil	ULSD, Gasoline	Magellan PL, Truck
Green Bay	**Citgo, Marathon, US Oil**	**ULSD, Gasoline, Aviation Gas, Jet Fuel**	**Pipeline, Truck, Rail and Water**
Green Bay	Citgo	ULSD, Gasoline	West Shore PL*, Truck
Green Bay	Marathon	ULSD, Gasoline, Aviation Gas	West Shore PL*, Truck
Green Bay	US Oil – Fox River	ULSD, Gasoline	Barge, ship, West Shore PL*, Truck, CN RR
Green Bay	US Oil – Buckeye	ULSD, Gasoline	West Shore PL*, Truck
Green Bay	US Oil – Prods	Gasoline, Jet Fuel	West Shore PL*, Truck
Junction City	**Flint Hills**	**ULSD, Gasoline, Propane**	**Pipeline and Truck**
Junction City	Flint Hills	ULSD, Gasoline, Propane,	Flint Hills PL, Truck
Madison / McFarland	**Citgo, Flint Hills, US Oil**	**ULSD, Gasoline, Jet, Refined Products**	**Pipeline and Truck**
Madison	Citgo	ULSD, Gasoline	West Shore PL, Truck
McFarland	Flint Hills	ULSD, Gasoline	West Shore PL, Flint Hills PL, Truck
McFarland	US Oil – Buckeye	ULSD, Gasoline	West Shore PL, Truck
McFarland	US Oil – Madison	ULSD, Gasoline, Jet Fuel	West Shore PL, Flint Hills PL, Truck
Milwaukee	**Flint Hills, Shell, US Oil, Wolfe Lake, Citgo, Marathon, Buckeye**	**ULSD, Gasoline, RBOB, CBOB Refined Products, Fuel Oil, Kerosene**	**Pipeline, Truck, Rail and Water**
Milwaukee	Flint Hills	Refined products	West Shore PL, Flint Hills PL, Truck
Milwaukee	Shell - Mitchell Field	Refined Products	West Shore PL
Milwaukee	US Oil - Central	ULSD, RBOB, CBOB	West Shore PL, Truck
Milwaukee	US Oil - North	ULSD, RBOB	West Shore PL, Truck
Milwaukee	US Oil - South	ULSD, RBOB, Gasoline	West Shore PL, Truck
Milwaukee	Wolfe Lake Term	Fuel Oil	Ship, barge, UP, CP, Truck
Milwaukee	Citgo	Refined products	West Shore PL, Truck
Milwaukee (Granville)	Marathon	ULSD, Gasoline, Kerosene	West Shore PL, Truck
Milwaukee (Granville)	Buckeye	ULSD, Gasoline	West Shore PL, Truck
Waupun	**Flint Hills**	**Refined products**	**Pipeline and Truck**
Waupun	Flint Hills	Refined products	Flint Hills PL, West Shore PL, Truck

Source: International Liquid Terminals Association

* The West Shore Pipeline has not serviced Green Bay since March 2016

5.8 National Transportation Networks in Wisconsin

The United States transportation system is a vast, complex network of almost seven million miles of highways, local roads, railways, navigable waterways, and pipelines. The components of this system are linked to each other through thousands of seaports, airports, and intermodal facilities. This system accommodates the movement of goods, cargo, raw materials, and finished products from the entire spectrum of the agricultural, manufacturing, and wholesale and retail trade sectors of our economy.

Multiple modes (multimodal transport) are used to carry freight. The largest percentage of United States freight (by tonnage) is carried by trucks (70 percent), railroads (9 percent), pipeline (8 percent), ship (4 percent), and airplanes (1 percent).[92] Other modes of transportation, such as parcels and intermodal freight account for the remaining eight percent. Thus, multimodal transportation offers an advanced platform for the efficient, reliable, safe, flexible, and resilient movement of freight. The multimodal United States transportation system connects Wisconsin's key gateways and corridors to the nation and plays an important role in linking Wisconsin to the global economy. The economic productivity of Wisconsin is dependent on the overall transportation performance of the United States transportation system as well as its own transportation system. Therefore, it is important to examine the connections of the United States transportation system to Wisconsin.

National Multimodal Freight Network

Recognizing the importance of multimodal connections, the Fixing America's Surface Transportation (FAST) Act directed the United States DOT to establish National Multimodal Freight Network (NMFN) (Figure 5-26). This interim network is comprised of the following components: [93]

- National Highway Freight Network (NHFN)
- Class I railroads
- Large public ports
- Inland and intercoastal waterways
- Great Lakes and St. Lawrence Seaway
- The 50 largest airports
- Other strategic freight assets

National Multimodal Freight Network

The FAST Act directs the United States DOT to establish a NMFN designed to:

- Assist states in strategically directing resources toward improved system performance for the efficient movement of freight on the network
- Inform freight transportation planning
- Assist in the prioritization of federal investment
- Assess and support federal investments to achieve the goals of the National Multimodal Freight Policy and of the National Highway Freight Program

The United States DOT was directed to consult with freight stakeholders, including state DOTs, to develop the final NMFN by December of 2017. States may propose additional designations to the network after considering nominations from Metropolitan Planning Organizations (MPOs), freight advisory committees, ports, airports, and rail and pipeline operators. The United States DOT must redesignate the network at least every five years.

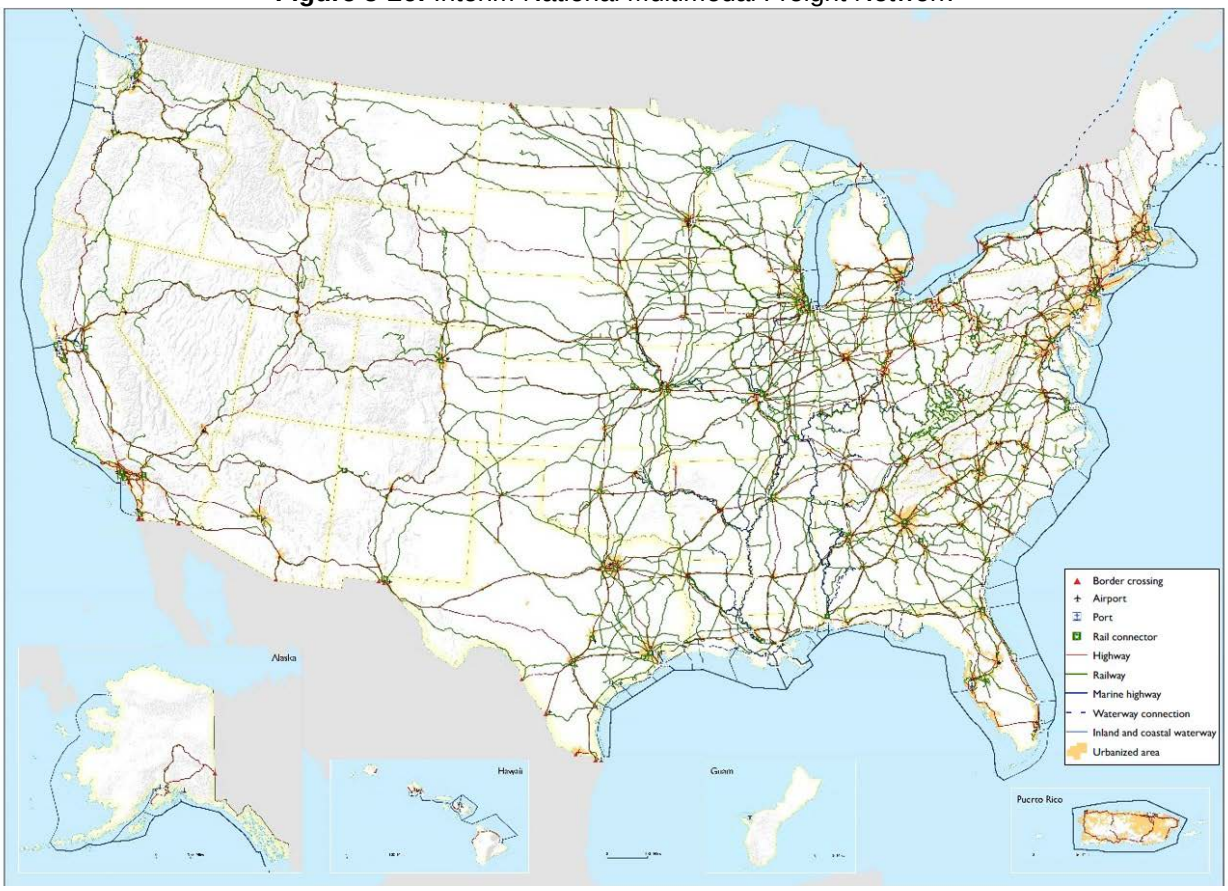
The purpose of the NMFN map is to inform planners and the public of national interest relative to major freight flows and direct special attention to freight issues as warranted. Many important freight opportunities, however, will occur off the NMFN routes, including in first- and last-mile links in urban and rural areas. However, the proposed version of the NMFN does not reflect the importance of Wisconsin's key corridors and connecting roads that are essential for multimodal freight mobility. With some small exceptions, the NMFN only includes Interstate Highways. The NMFN does not include much of non-interstate highway Corridors 2030 Backbone routes, including US 53 (Eau Claire – Superior), US 151 (Dubuque – US 12/18 in Madison and I-94 in Madison to Fond du Lac), US 10 (Menasha – Stevens Point), US 41 (north of Green Bay), and STH 29 (entire length from Chippewa Falls to Green Bay). As currently proposed, the NMFN includes only one percent of the state's highway mileage.

In addition, the current version of the NMFN includes all Class I Railroads (including those out-of-service), General Mitchell International Airport, the Mississippi River and Great Lakes Marine Highways, and the Ports of Superior,

[92] U.S. Bureau of Transportation Statistics, "Freight Facts and Figures, 2015."
[93] Federal Highway Administration, "Fixing America's Surface Transportation Act or 'FAST Act'."

Green Bay, and Milwaukee. It does not include any Class II or Class III lines (no Wisconsin & Southern lines are included) and it does not include either of Wisconsin's rail-truck intermodal facilities (Chippewa Falls or Arcadia).

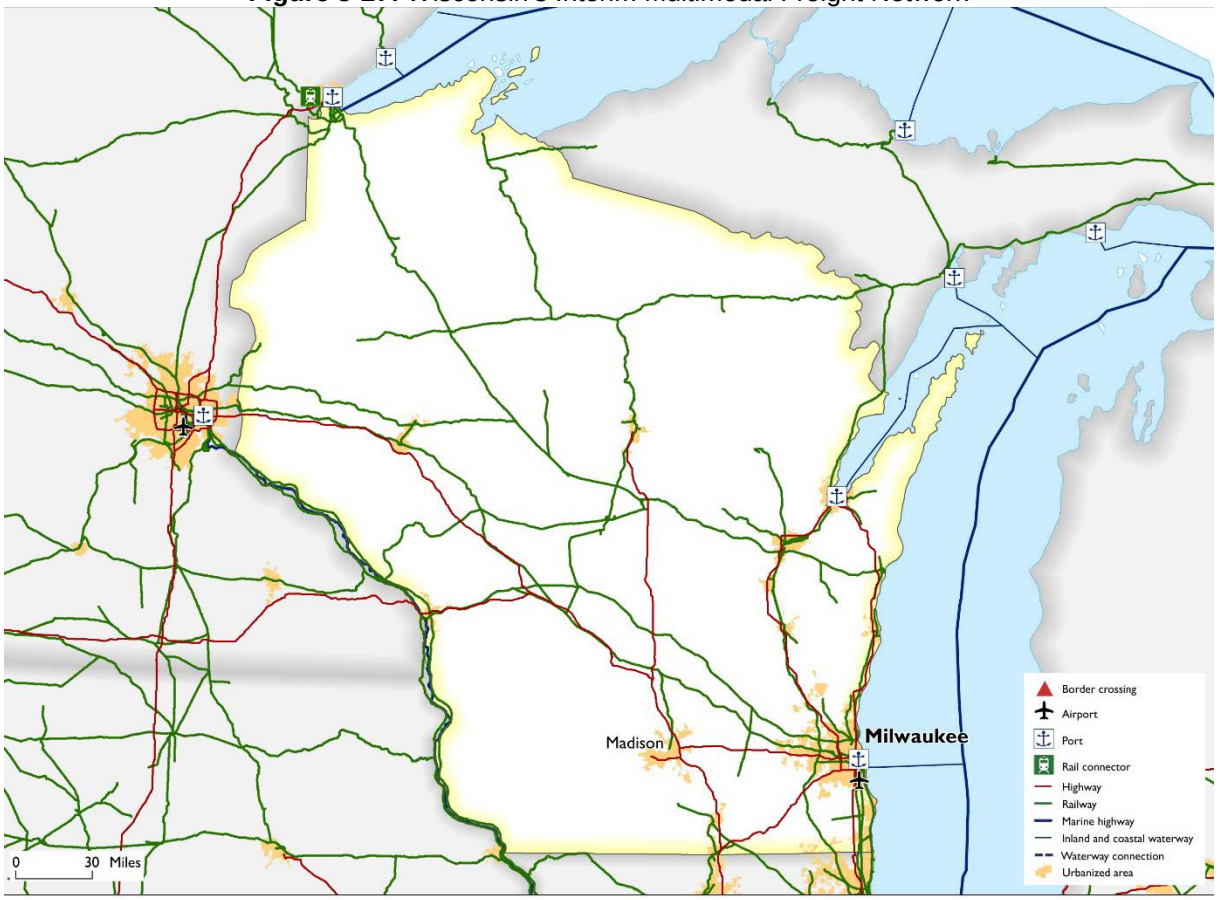
Figure 5-26: Interim National Multimodal Freight Network



Source: U.S. Department Of Transportation

Figure 5-27 displays the portions of the interim NMFN in Wisconsin.

Figure 5-27: Wisconsin's Interim Multimodal Freight Network



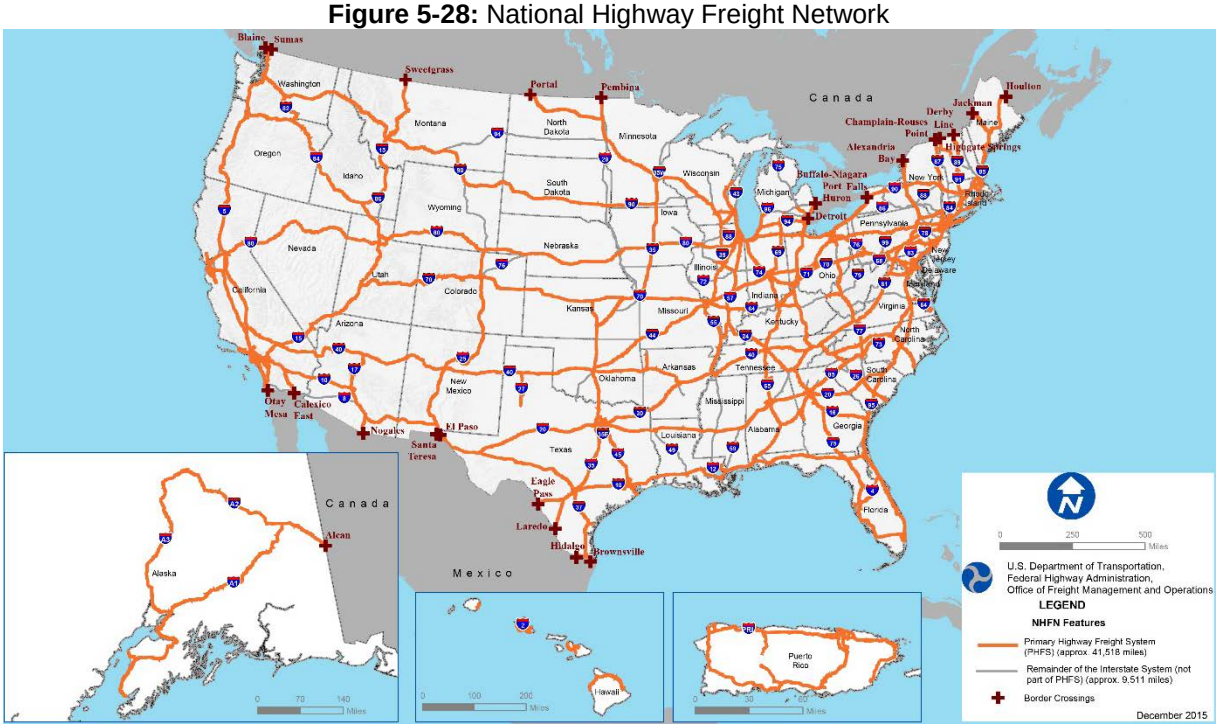
Source: U.S. Department Of Transportation

National Highway Freight Network

In addition to the NMFN, the FAST Act directed the FHWA Administrator to establish a National Highway Freight Network (NHFN) to aid in strategically directing federal resources and policies toward improved performance of highway portions of the United States freight transportation system.[94] The NHFN identifies roadways to help direct resources towards improving system performance for efficient movement of freight on highways.[95] In Wisconsin, over 900 miles are under this designation, which includes all of Wisconsin's Interstates and a limited number of state highways.[96] The NHFN is shown in Figure 5-28.

[94] Federal Highway Administration, "National Highway Freight Network."
[95] Ibid.
[96] Ibid.

Figure 5-28: National Highway Freight Network



Source: U.S. Department Of Transportation

The NHFN includes the following subsystems of roadways:

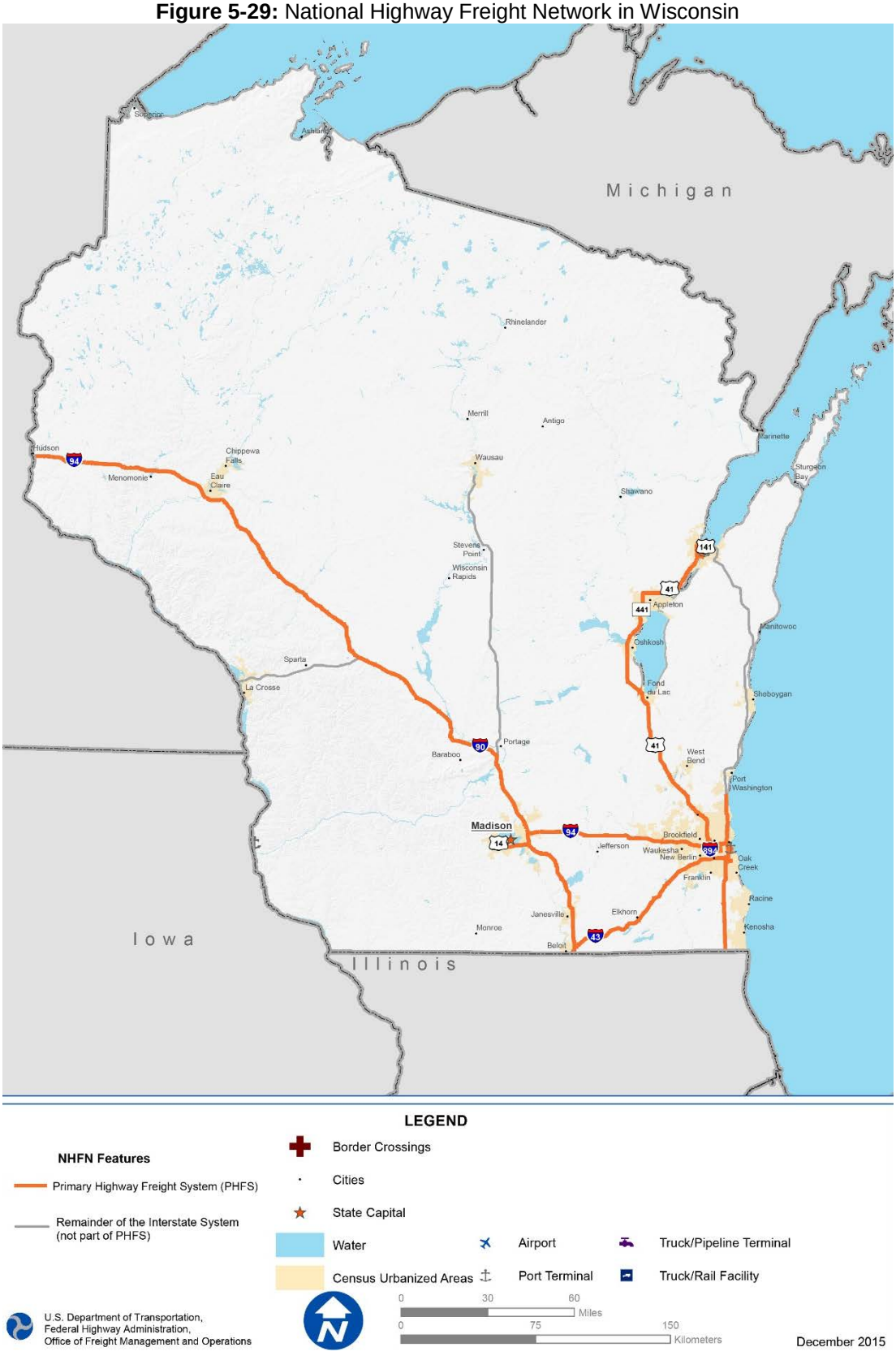
- **Primary Highway Freight System (PHFS):** A network of highways identified as the most critical highway portions of the United States freight transportation system determined by measurable and objective national data. The network consists of 41,518 centerline miles, including 37,436 centerline miles of Interstate and 4,082 centerline miles of non-Interstate roads.
- **Other Interstate portions not on the PHFS:** Highways consisting of the remaining portion of Interstate roads not included in the PHFS. These routes provide important continuity and access to freight transportation facilities. These portions amount to an estimated 9,511 centerline miles of Interstate nationwide, and will fluctuate with additions and deletions to the Interstate Highway System.
- **Critical Rural Freight Corridors (CRFCs):** Public roads not in an urbanized area that provide access and connection to the PHFS and the Interstate with other important ports, public transportation facilities, or other intermodal freight facilities.
- **Critical Urban Freight Corridors (CUFCs):** Public roads in urbanized areas that provide access and connection to the PHFS and the Interstate with other ports, public transportation facilities, or other intermodal transportation facilities.

States, and in certain cases MPOs, are responsible for designating public roads for the CRFCs and CUFCs in accordance with section 1116 of the FAST Act. State designation of the CRFCs is limited to a maximum of 150 miles of highway or 20 percent of the PHFS mileage in the state, whichever is greater. State and MPO designation of the CUFC are limited to a maximum of 75 miles of highway or 10 percent of the PHFS mileage in the state, whichever is greater.

Figure 5-29 displays Wisconsin's PHFS and non-PHFS interstate roadways. Wisconsin has a total of 652 miles of PHFS and 257 miles of non-PHFS interstate in the state.[97] The FAST Act allows a maximum of 150 miles of CRFC and 75 miles of CUFC in Wisconsin.[98] Southeastern Wisconsin Regional Planning Commission (SEWRPC) is the one metropolitan planning organization (MPO) in the state (population > 500K) with the ability to designate its corridors, in collaboration with WisDOT. WisDOT and MPOs (for urbanized areas over 500,000) are responsible for jointly determining how to distribute the CUFC mileage among the urbanized areas. WisDOT must consult with SEWRPC on CUFC designation, however, WisDOT will facilitate CUFCs designation with all Wisconsin MPOs to determine the appropriate distribution of mileage (and subsequent funds) to all urban areas in the state. In terms of the 150 miles of CRFCs, three critical routes from the Corridors 2030 Backbone – US 53, US 151, and STH 29 – together comprise around 500 miles, more than three times the mileage available for designation. As a result, WisDOT will work with MPOs, RPCs, the FAC, and other stakeholders to designate CUFCs and CRFCs. The designation of these corridors will occur after the State Freight Plan has been published.

[97] Federal Highway Administration, "National Highway Freight Network Map and Tables for Wisconsin."
[98] Federal Highway Administration, "FAST Act, Section 1116 National Highway Freight Program (NHFP) Guidance: Designating and Certifying Critical Rural Freight Corridors and Critical Urban Freight Corridors."

Figure 5-29: National Highway Freight Network in Wisconsin



Source: U.S. Department Of Transportation