



U.S. Department of Transportation
Federal Highway Administration

Office of Operations

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Washington, D.C. 20590

<https://ops.fhwa.dot.gov/freight>

Federal Highway Freight Programs

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January 10, 2023



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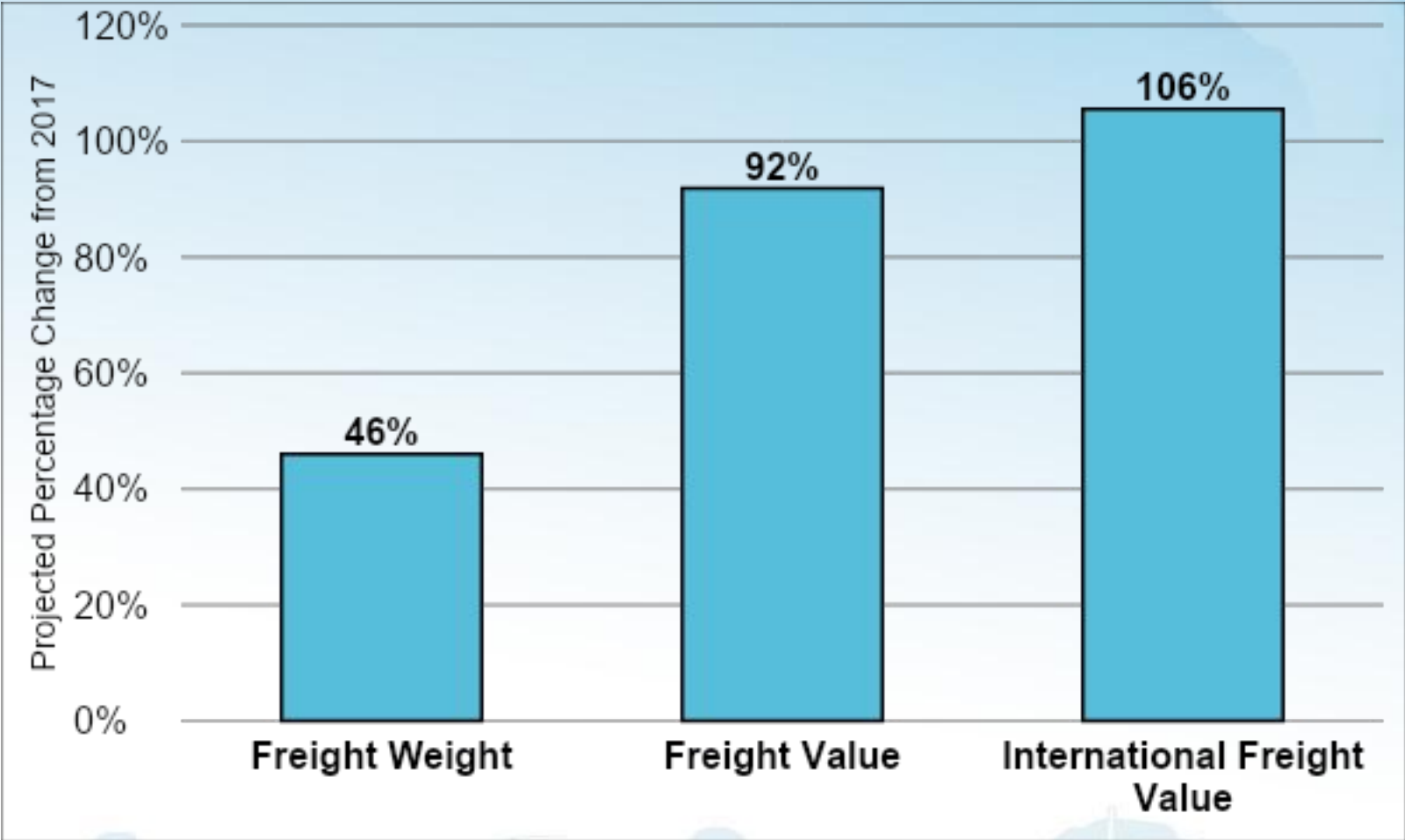


Outline

- This overview will cover recent activities in freight research at the US Department of Transportation's Federal Highway Administration; technical assistance; and program implementation.
- Key Topics are:
 - » State Freight Plans and State Freight Advisory Committees
 - » Truck Parking
 - » Freight Research and Data Initiatives



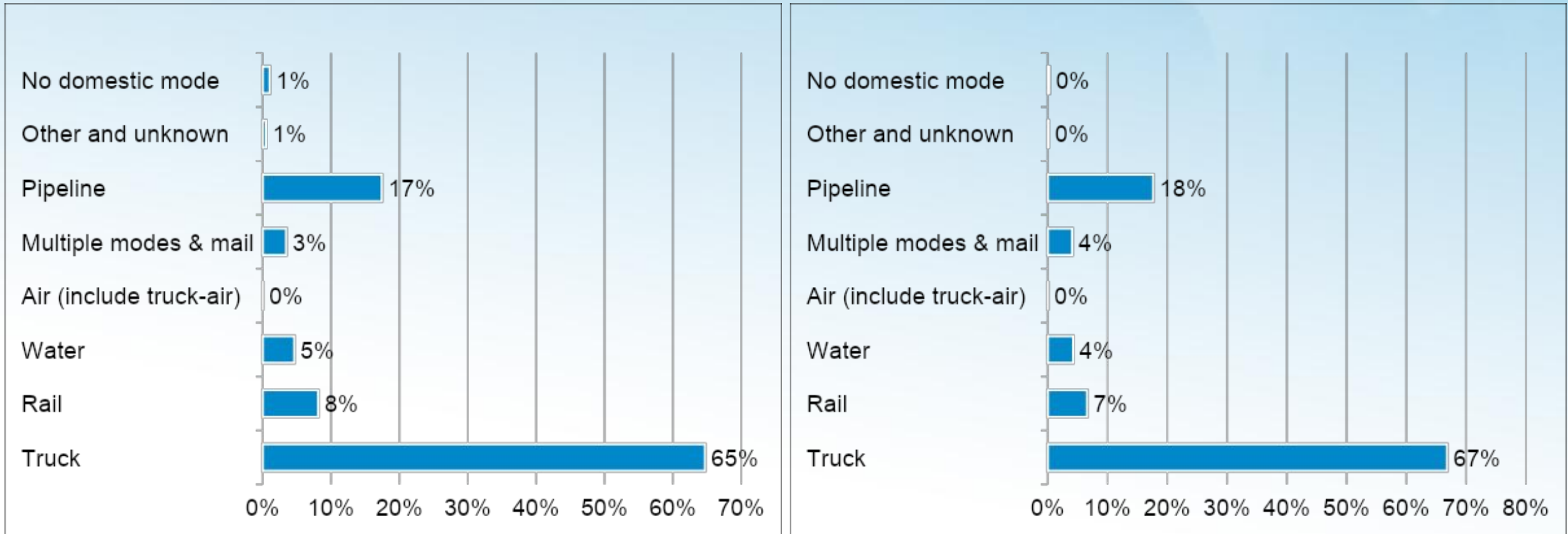
Projected Growth In U.S. Freight By 2050



Source: United States Department of Transportation (USDOT), FHWA, Office of Freight Management and Operations, FAF, version 5.4, 2022

Trucks: The Predominant Freight Carrier in the U.S.

Freight demand expected to grow from 19.8 billion tons (2017) to 28.9 billion tons (2050)



Source: USDOT, FHWA, Office of Freight Management and Operations, FAF, version 5.4, 2022



State Freight Plans and State Freight Advisory Committees



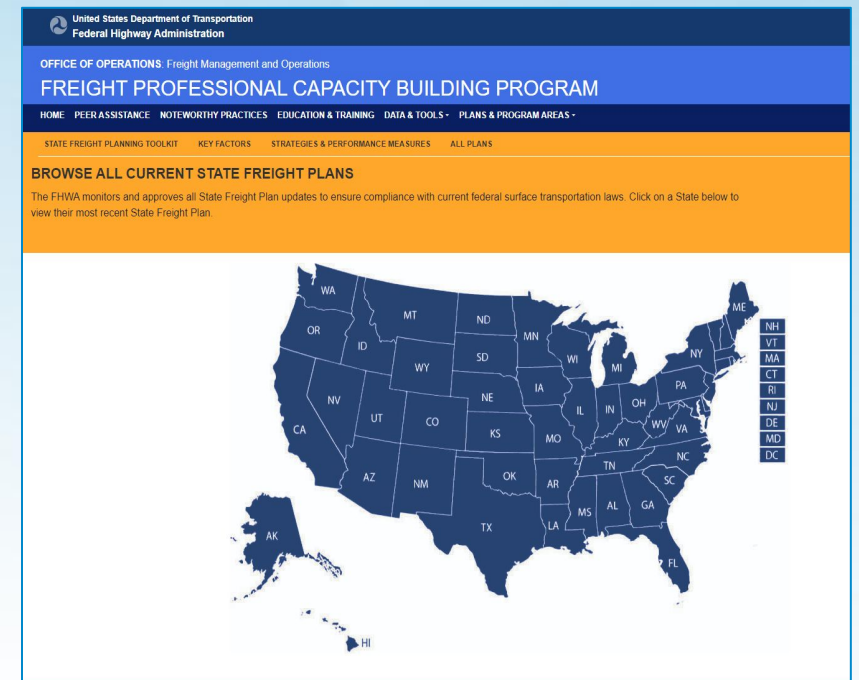
Background: Fixing America's Surface Transportation (FAST) Act of 2015

- The FAST Act (Public Law 114-94) created a new multimodal freight subtitle (under Title 49) that included a section with 10 requirements for State Freight Plans (49 United States Code (U.S.C.) § 70202) and additional parameters for State Freight Advisory Committees (49 U.S.C. § 70201)
- The FAST Act also added a requirement that States receiving FHWA National Highway Freight Program (NHFP) funding develop a State Freight Plan consistent with the requirements in 49 U.S.C. § 70202
- Every State and the District of Columbia ultimately completed a State Freight Plan
- State Freight Plans were required to be updated every 5 years
- State Freight Advisory Committees were defined and encouraged but not required



State Freight Plans and State Freight Advisory Committees: An Update

- The Bipartisan Infrastructure Law (BIL)/Infrastructure Investment and Jobs Act (IIJA) (Public Law 117-58) added new elements to existing law requiring State Freight Plans as a condition of funding and changed the update cycle to 4 years
- US DOT issued guidance earlier in 2023 outlining these requirements and recommended improvements
- Approximately half of the nation's State Freight Plans have been updated and approved in compliance with the BIL/IIJA
- Freight plans can be found on the “**Freight Professional Capacity Building (FPCB) Browse All Current State Freight Plans**” [web page](#) by selecting the desired State



Source: Federal Highway Administration (FHWA)

Figure 1: Screenshot of FHWA Freight Professional Capacity Building web page for current State Freight Plans

Bipartisan Infrastructure Law/Infrastructure Investment and Jobs Act Changes to State Freight Plans and State Freight Advisory Committees

- BIL/IIJA updates the list of representatives that should be included among the membership of State Freight Advisory Committees and adds a subsection noting the qualifications that State Freight Advisory Committee members should have
 - NOTE: BIL/IIJA does not mandate that States establish State Freight Advisory Committees
- The updated guidance USDOT issued on State Freight Plans and State Freight Advisory Committees on January 12, 2023 encourages States to establish State Freight Advisory Committees and provides suggestions on how to establish these committees
- As of December 2022, **36** State Freight Advisory Committees had met in the previous 6 months



New Bipartisan Infrastructure Law/Infrastructure Investment and Jobs Act Required State Freight Plan Elements

BIL retained the 10 FAST Act elements and added the following new elements:

10. The most recent commercial motor vehicle parking facilities assessment conducted by the State under 49 U.S.C. § 70202(f)
11. The most recent supply chain cargo flows in the State, expressed by mode of transportation
12. An inventory of commercial ports in the State
13. If applicable, consideration of the findings or recommendations made by any multi-State freight compact to which the State is a party under 49 U.S.C. § 70204 (Multi-State Freight Corridor Planning)
14. The impacts of e-commerce on freight infrastructure in the State
15. Considerations of military freight
16. Strategies and goals to decrease:
 - A. The severity of impacts of extreme weather and natural disasters on freight mobility
 - B. The impacts of freight movement on local air pollution
 - C. The impacts of freight movement on flooding and stormwater runoff
 - D. The impacts of freight movement on wildlife habitat loss

Strategies and Goals to Decrease the Impacts of Extreme Weather, Flooding/Stormwater Runoff, Local Air Pollution, and Wildlife Habitat Loss

- Each of these 4 sub-bullets must be addressed and for each, State Freight Plans must include both goals and strategies under 49 U.S.C. § 70202 (b)(16)
- Looking for specific references to these items:
 - Example: Overall goal of environmental stewardship—would need to see specific subgoals or objectives related to local air pollution, wildlife habitat loss, etc.
 - Strategies should specifically reference these areas as well
- Going forward, we encourage States to consider including performance measures that address these areas, in addition to common existing measures around safety and state of good repair
- Strongly encourage States to consider environmental justice and equity impacts from freight movements in their State Freight Plans



Truck Parking



Why Is Truck Parking Important?

Just as the trucking industry is critical to the Nation's economic success and way of life, **SAFE, ACCESSIBLE TRUCK PARKING** is critical to truck drivers.



Long-haul

Long-haul drivers are on the road days, and sometimes weeks, at a time traveling across the country.



Staging

Truck drivers picking up and delivering freight at manufacturing plants, warehouses, and distributions centers need a place to park to await their appointment time.



30-minute break

As part of the federally mandated 30-minute break, the driver must be off duty, meaning they are no longer working and will not have to move the truck for any reason.



Emergency

Drivers may be impacted by an incident that has either closed or severely congested the roadway and they need a place to park.



Time off

Independent drivers do not have a company facility to provide parking during time off. They are done with their work week and need a place to park their truck while off-duty.

Truck Parking and Safety

Roadway safety is at the heart of the Department of Transportation's mission and the National Roadway Safety Strategy. Missions and activities of the Department's modal administrations align with ensuring safe, secure and adequate truck parking. Truck parking concerns are safety concerns for *all* roadway users and communities, which motivate the Department to:

- Deliver world-class highway and street programs that advance safe, efficient, equitable, and sustainable mobility choices for all while strengthening the Nation's economy, and
- Reduce fatalities, injuries, and crashes involving large trucks and buses

With 70 percent of domestic freight moved by trucks, when and where to park, sleep and maintain personal security and public safety is an obstacle for drivers and job performance. The underlying causes of crashes include driver fatigue, a contributing factor in 1 of every 7 crashes involving a commercial motor vehicle. And unsafe parking on the roadside, local streets and unsanctioned vacant lots further compromise driver safety.

- 98% of drivers regularly experience problems finding safe parking and personal security is paramount

“Ensuring trucking jobs are good jobs is foundational to a strong, and stable trucking workforce” – *Trucking Action Plan*

Truck Parking and FHWA's Mission

FHWA's mission is to deliver world-class highway and street programs that advance safe, efficient, equitable, and sustainable mobility choices for all while strengthening the Nation's economy.

- FHWA leads the Jason's Law Truck Parking Survey and Assessment.
- FHWA leads the National Coalition on Truck Parking, partnering with stakeholder organizations representing trucking, commercial vehicle safety officials, State departments of transportation, and the truck stop industry.
- FHWA has facilitated multiple Truck Parking Workshops with States across the country that bring together truck parking stakeholders to collaborate on solutions.
- FHWA issued guidance on truck parking funding eligibility, stating that truck parking may qualify for 100 percent Federal share as a safety improvement.
- FHWA encourages communication and partnership with private sector truck stop operators and the trucking industry in the siting and development of projects.



Truck Parking and Federal Motor Carrier Safety Administration's (FMCSA) Safety Mission

FMCSA's mission is to reduce fatalities, injuries, and crashes involving large trucks and buses. Creating access to designated safe and secure parking is foundational for roadway safety, as commercial driver fatigue is a dangerous risk factor for crashes.

FMCSA works in partnership with FHWA at headquarters and in each division office nationwide.

- Bringing together stakeholders to engage in the state's planning processes

FMCSA offers the High Priority Grant Information Technology Deployment (ITD) discretionary grant program.

- \$25 million per year
- Develop and deploy truck parking information systems
- Most recently FMCSA funded projects in KY and MT



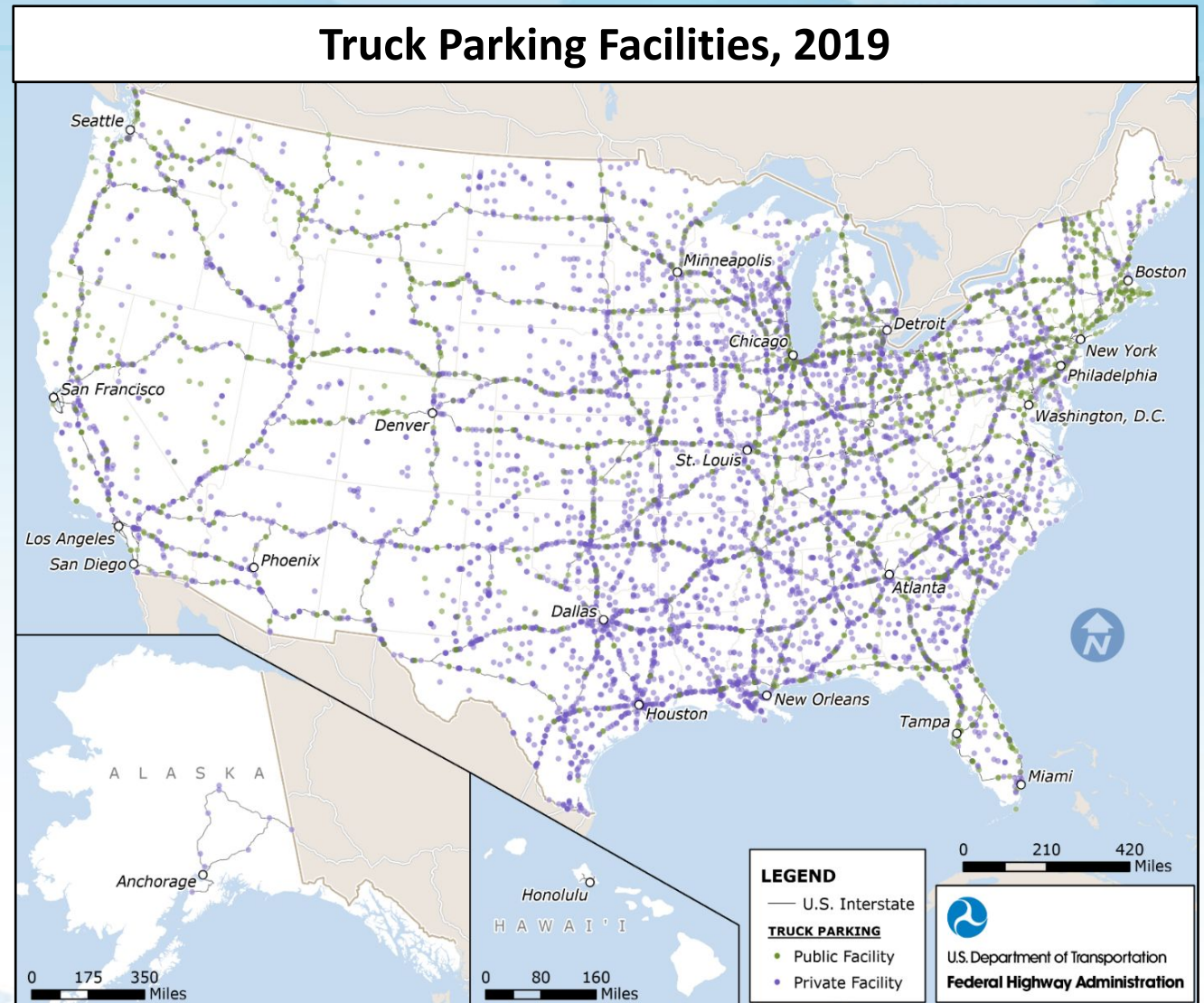
Jason's Law Truck Parking Survey and Assessment

- Truck parking shortages are still a major problem in every State and region.
- Major freight corridors and large metro areas have the most acute shortages.
- Shortages exist at all times of the day, week, and year, but most occur overnight and on weekdays.
- Challenges exist in funding and maintaining truck parking for public and private sector.
- Truck stop operators need business models that incorporate parking profitably.
- Local government involvement and citizen awareness are needed for effective discussions and realistic plans for truck parking.



Parking Inventory Results

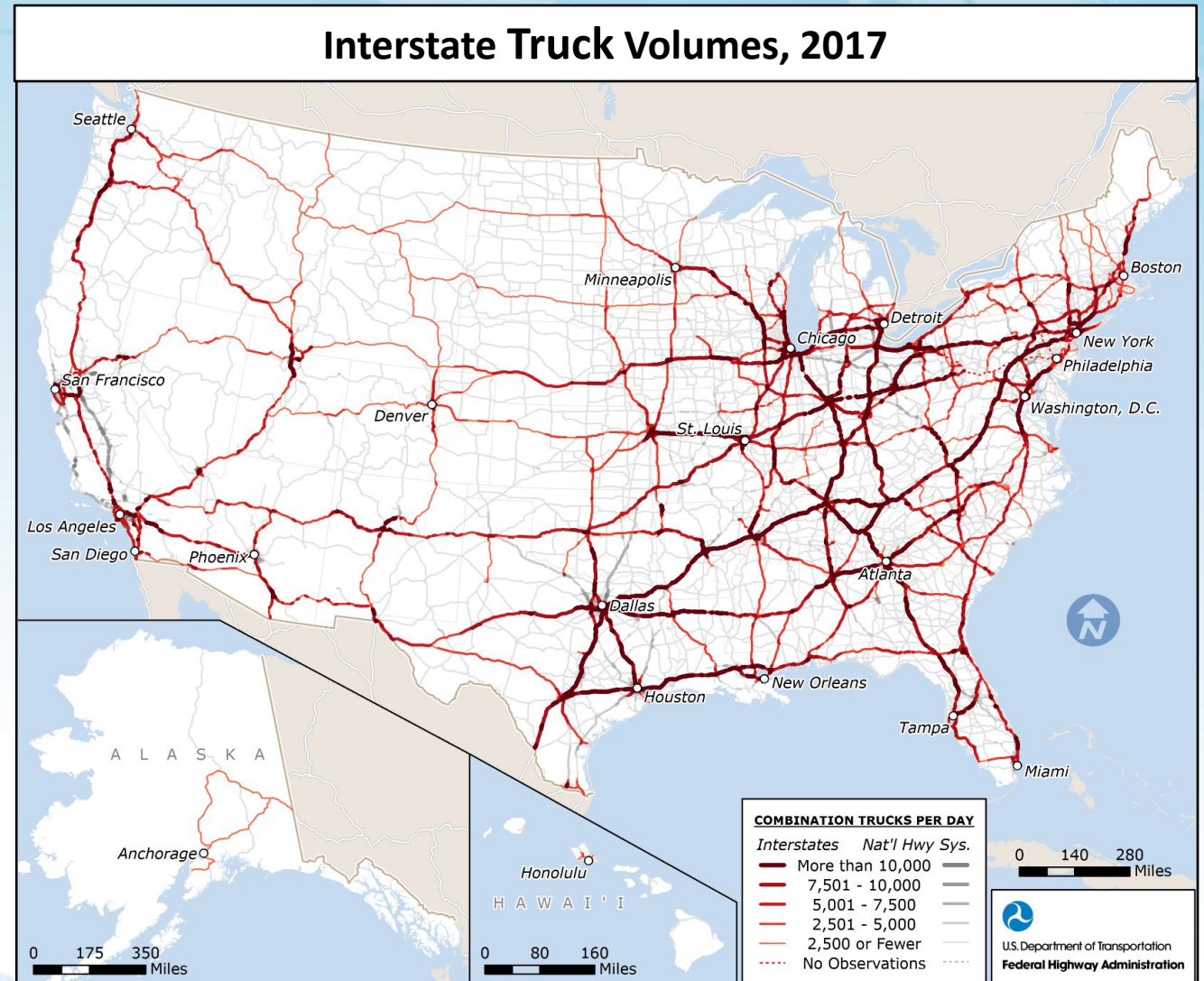
- There are approximately 313,000 truck parking spaces nationally:
 - 40,000 at public rest areas
 - 273,000 at private truck stops
- Between 2014–2019, there was an increase in truck parking spaces:
 - 6 percent increase in public parking spaces
 - 11 percent increase in private parking spaces



Source: FHWA.

Parking Inventory Results

- Current survey includes areas of shortage similar to 2014:
 - I-95 Mid-Atlantic and north
 - Chicago area
 - California
- New shortages emerged in additional locations since 2014:
 - Throughout entire I-95 corridor
 - Pacific corridors
 - States surrounding Chicago region
 - Other major freight corridors

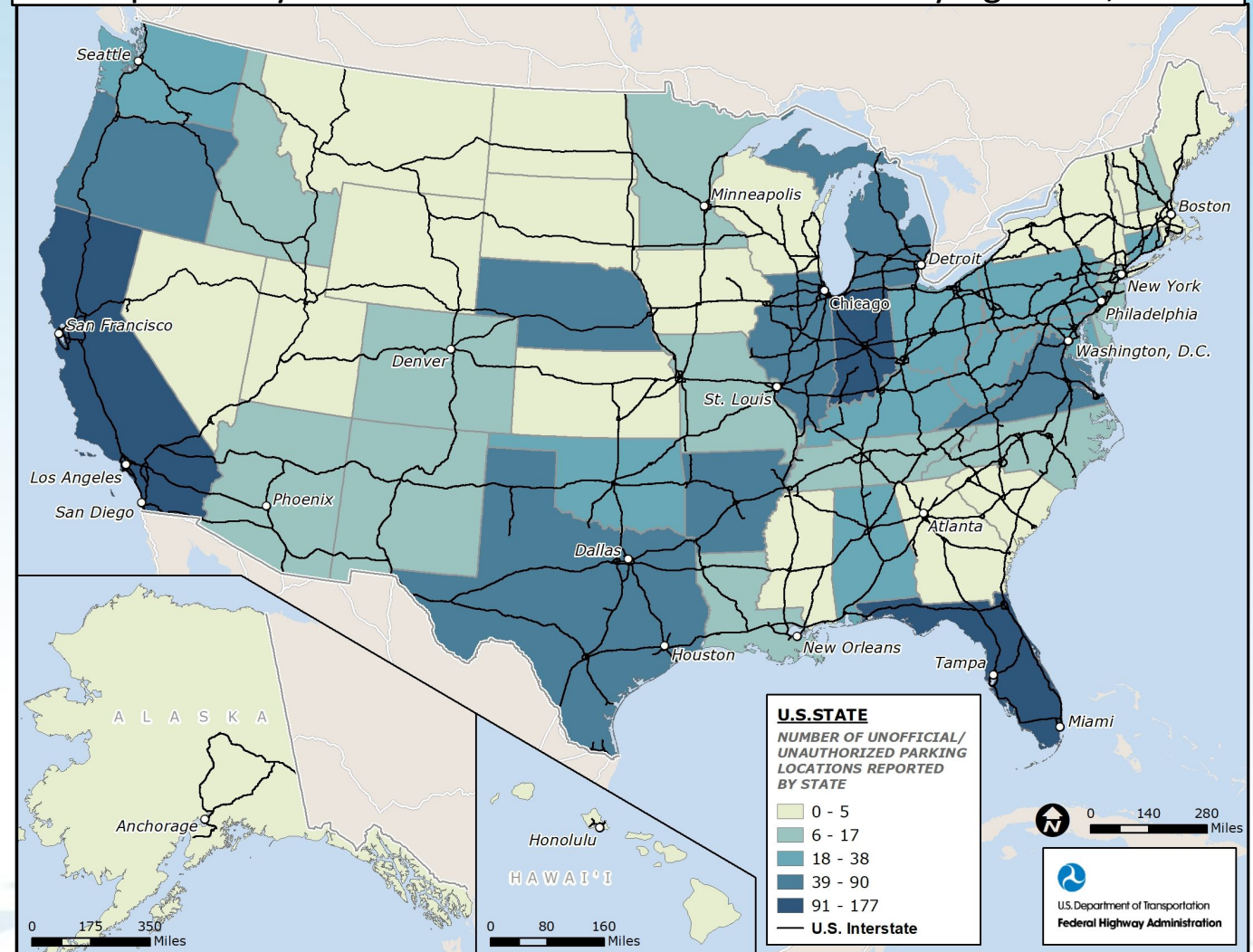


Source: FHWA.

Commercial Motor Vehicle Safety Agencies

States that reported the highest number of locations with frequent unofficial unauthorized parking tend to have major freight generating areas, major ports, and intermodal facilities.

Number of Locations with Frequent Unofficial/Unauthorized Parking
As reported by State Commercial Motor Vehicle Safety Agencies, 2019

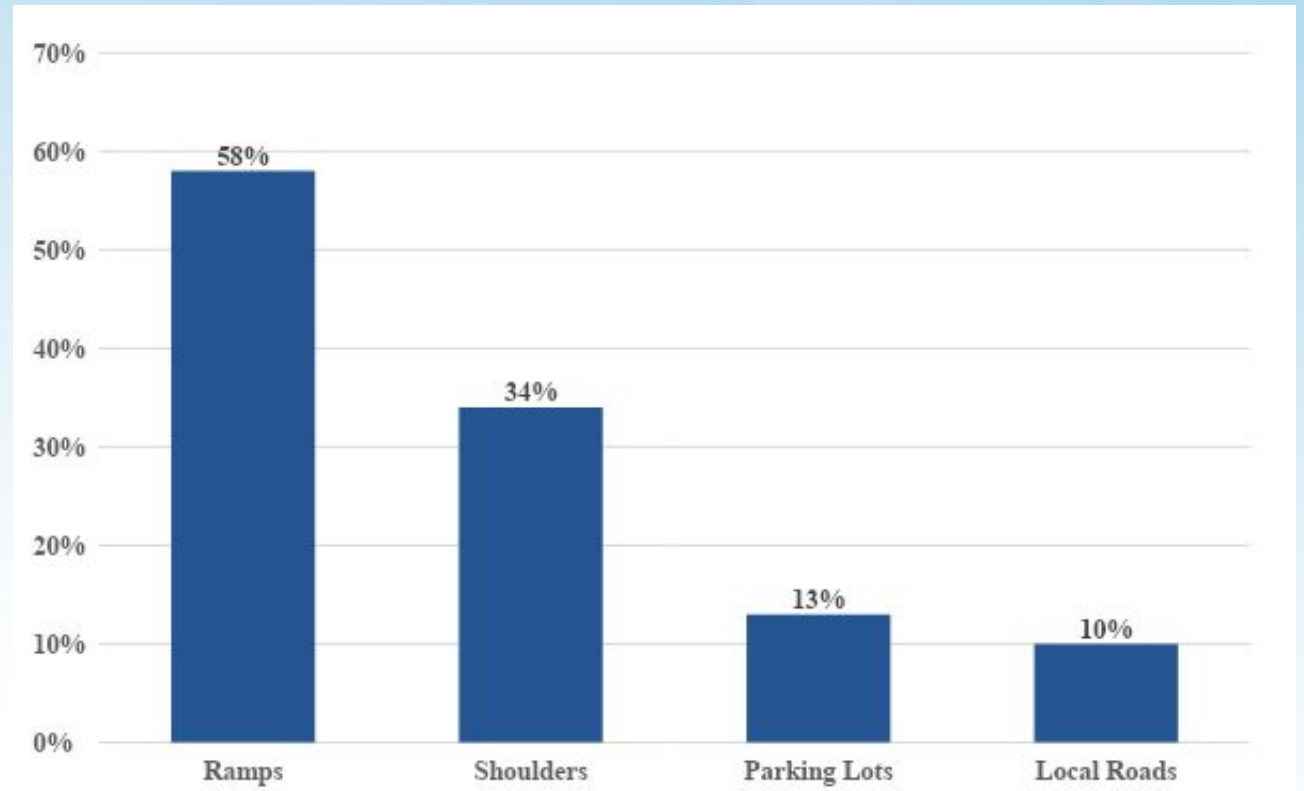


Source: FHWA.

Commercial Motor Vehicle Safety Agencies

- Unofficial/unauthorized parking occurs mostly on ramps and highway shoulders.
- Unofficial/unauthorized parking throughout the day, but the most frequently between 7PM and 9AM.

Types of Locations with Frequent Unofficial/Unauthorized Parking, 2019



Source: FHWA.



State DOT – Observations

- Not many new public facilities or spaces are being developed.
- Challenges exist in planning, funding, and accommodating truck parking.
- Business models and impacts need research and discussion.
- Local government involvement and education is needed.



Source: FHWA.

Truck Drivers – Observations

- Truck parking is most problematic along key freight corridors and in metropolitan areas.
- Drivers need a variety of parking types.
- Design is important in truck parking.
- Safety/security is valued.
- Public rest area closures present challenges.
- Truck spaces need to be reserved for trucks.
- Regulations impact parking.
- Receivers should offer parking on site.
- A public sector/citizen connection to trucks is needed.
- Drivers using apps and smart technology for routing and parking.



Source: FHWA.

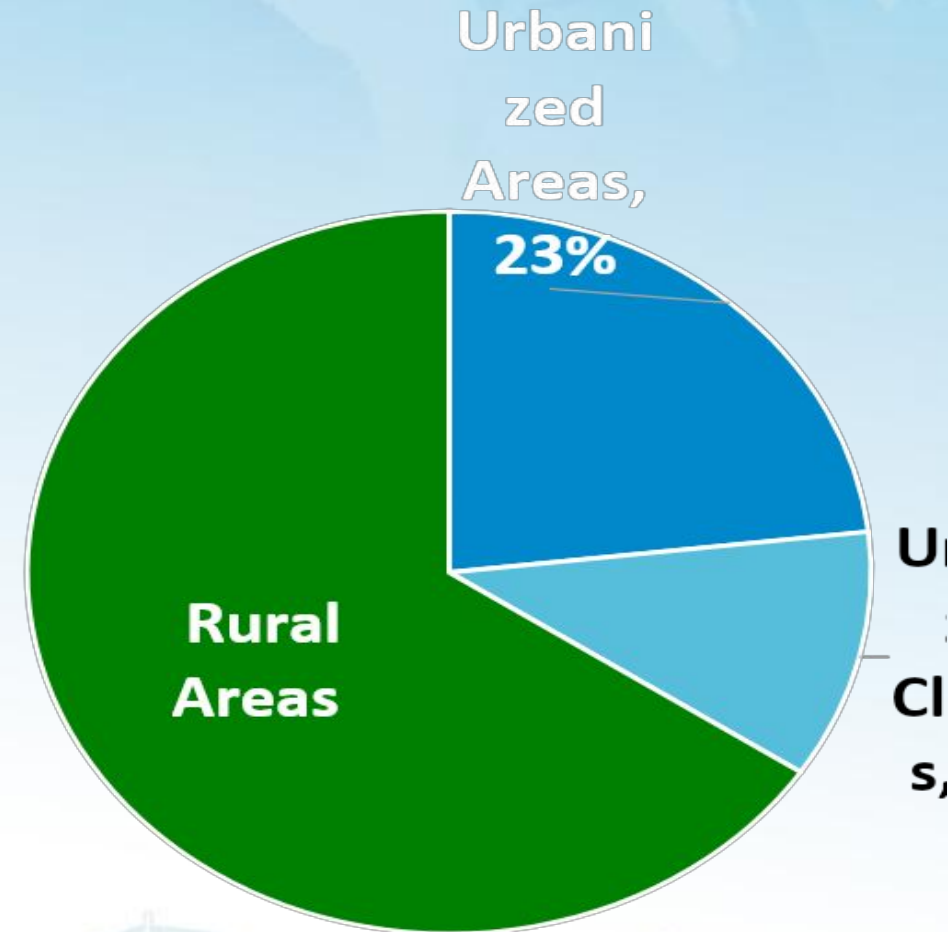
Truck Parking by Urban and Rural Areas

Proportion of Spaces in Rural and Urbanized Areas

	Percent of NHS Truck VMT	Percent of Total Parking Spaces
Urban areas	47%	34%

Rural areas (32 urbanized areas with the greatest freight origins/destinations (38 percent of truck freight tonnage) only have 8.5 percent of truck parking spaces.

- This percentage breakdown reinforces the need for parking near freight destinations and integration of truck parking with regional/local planning.



Urbanized areas \geq 50,000 population
 Urbanized clusters 2,500 – 50,000 population

Truck Parking Activities Update



State Freight Plan Commercial Motor Vehicle Parking Facilities Assessments

Section 70202(f) of title 49, United States Code – Commercial Motor Vehicle Parking Facilities Assessments: As part of the development or updating of a State freight plan, each State, in consultation with relevant State motor carrier safety personnel, shall conduct an assessment of:

- The capability of the State, together with the private sector in the State, to provide adequate parking facilities and rest facilities for commercial motor vehicles engaged in interstate transportation;
- The volume of commercial motor vehicle traffic in the State; and
- Whether there exist any areas within the State with a shortage of adequate commercial motor vehicle parking facilities, including an analysis (economic or otherwise, as the State determines to be appropriate) of the underlying causes of such a shortage.



Truck Parking Funding Eligibility – Federal-Aid Formula

States may use the following Federal-aid highway funding programs for truck parking projects as described under section 1401(b) of MAP-21 (Jason's Law):

- Surface Transportation Block Grant Program (STBG)
- National Highway Freight Program (NHFP)
- Highway Safety Improvement Program (HSIP)
- National Highway Performance Program (NHPP)
- Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT)
- Carbon Reduction Program (CRP)
- Congestion Mitigation and Air Quality Improvement Program (CMAQ)



Truck Parking Funding Eligibility – Federal-Aid Discretionary

States and other eligible public entities can also apply for discretionary grants:

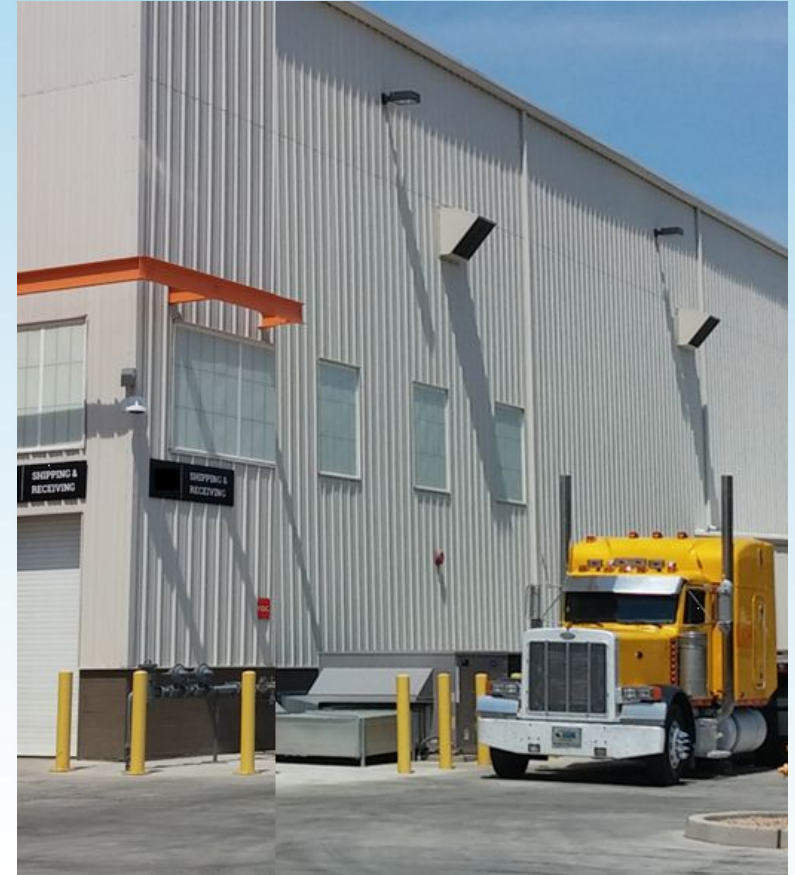
- Infrastructure for Rebuilding America (INFRA) Grants
- Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grants
- Rural Surface Transportation Grants
- National Infrastructure Project Assistance (Mega) Grants
- Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) to make resilience improvements at truck parking facilities
- Advanced Transportation Technologies and Innovative Mobility Deployment (ATTIMD) Grants for truck parking information and management systems
- Federal Motor Carrier Safety Administration High Priority Innovative Technology Deployment (HP-ITD) Grants for truck parking information and management systems
- Reduction of Truck Emissions at Port Facilities Grants for advanced truck stop electrification systems
- Maritime Administration Port Infrastructure Development Program

Overview of the Truck Parking Development Handbook



Truck Parking Development Handbook

- Presents strategies for integrating truck parking with freight land uses
- Provides tools for estimating truck parking generation and needs
- Identifies benefits of truck parking and benefit/cost and economic impact analyses
- Discusses factors for identifying sites and designing truck parking
- Examines attributes for improving truck parking safety
- Provides case studies of successful truck parking developments



Source: FHWA.



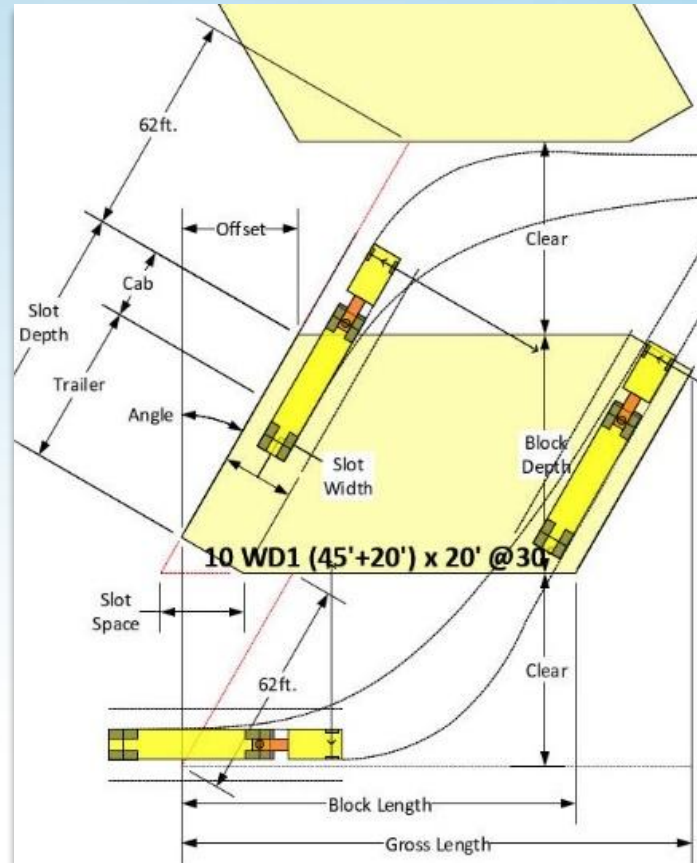
Commercial and Industrial Land Use

Parking Demand Considerations	Planning Implications
<ul style="list-style-type: none">• Where are these land uses located? Are they clustered or spread out?• Are deliveries and pick-ups confined to a time window?• Do sites have onsite truck parking?• Are trucks carrying oversize loads, such as heavy equipment?	<ul style="list-style-type: none">• Drivers typically want to park as close to their destination as possible.• Time limitations can result in accumulating staging demand prior to opening hours.• Onsite truck parking can reduce the demand for parking in other locations, such as rest areas.• Parking spaces with a larger footprint may not be available at truck stops and rest areas. Some jurisdictions have oversize/overweight curfew hours, causing trucks to park outside of city limits in unauthorized locations.



Key Design Attributes

- Truck trip generation and parking demand
- Access and circulation
- Turning radius
- Parking stall design
- Parking slot type
- Swept path
- Slot density



Source: FHWA.

- Roadway capacity and traffic congestion
- Roadway safety
- Air quality
- Noise emissions
- Light pollution
- Security at facilities



Barriers and Benefits of Onsite Parking

- Barriers
 - » Not commonly required today
 - » May be limited to new or re-developments
 - » State and local zoning powers and policies vary throughout the Nation
- Benefits
 - » Concentrates parking supply at point of staging demand
 - » Improves driver conditions potential to become a shipper of choice
 - » Site already generates truck traffic and associated externalities



Source: FHWA.



Barriers and Benefits of Shared Parking Facilities

- Barriers

- » Private businesses and property owners may have liability concerns.
- » Security policies at land, air, and water ports may limit when and where parking can occur.
- » Suitable publicly owned sites often need to fulfill other purposes (inspection sites, chain-up lots, weigh scales, park-and-rides).

- Benefits

- » Increases efficiency of parking in a concentrated area
- » Sites can be located near existing centers of truck activity
- » Security, wayfinding, waste, and maintenance are consolidated



Improving Land Use and Zoning Policies

- Incorporate truck parking into Traffic Impact Assessments (TIA):
 - » Truck trips can generate parking near the site (staging), as well as farther away (staging or rest breaks).
 - » TIAs should include parking onsite and off-site to address changing demand for parking.
- Revising Ordinances and Policies:
 - » Zoning code should require minimum truck parking onsite, similar to minimum parking requirements for residents, employees, or customers
 - » Handbook proposes language options based on square footage, employees, and loading docks
 - » Implemented by Township of Upper Macungie, Pennsylvania



Factors Generating Truck Parking Demand

**Commercial
and industrial
land use**



**Intermodal
generators**



**Through-truck
traffic**



Source: Cambridge Systematics.



Intermodal Generators

Parking Considerations	Planning Implications
<ul style="list-style-type: none">• Are deliveries and pick-ups confined to a time window?• How much freight is moved to/from trucks? For existing facilities, has this volume changed since initial facility design?	<ul style="list-style-type: none">• Time limitations can result in accumulating staging demand prior to opening hours.• Growth in containerized freight on trains and larger vessels can lead to increased truck traffic.



Truck Parking Demand

FACTORS DRIVING DEMAND FOR TRUCK PARKING

Federal Hours of Service (HOS) Regulations

Mandatory 10 hours of rest following 14 hours on duty

Required 30-minute breaks at prescribed intervals

Warehousing Logistics Inventory Management

Staging for pickup/delivery windows at factories and warehouses

Local parking for deliveries to replenish supplies and materials

Other

Local parking for deliveries to replenish supplies and materials

Unplanned parking due to breakdowns, traffic incidents, or weather-related closures



A New Tool to Estimate Truck Parking

- Trip generation and truck parking studies were combined to estimate parking demand based on two inputs:
 - » North American Industrial Classification System (NAICS) code
 - » Number of employees
- Primary data sources:
 - » Maricopa County Association of Governments (MAG) Truck Parking Study
 - » Texas A&M Transportation Institute (TTI) case studies in Texas and Maryland

Truck Parking Estimation Tool
 Green indicates fields that the user must populate, yellow fields can be changed by the user.
 Blue fields represent outputs or results of the estimation tool.

Linear Model Without Intercept

1 Estimate Daily Truck Stop Generation - 2 Digit NAICS Code

2-Digit NAICS

2-Digit NAICS Code	NAICS 31-33 Manufacturing
Coefficient	0.0077
Expansion Factor	4.67
Number of Employees	0

Daily Truck Stops Generated: 0

Estimate Distance of Truck Stops (for Industrial Facilities) - Prior to and after facility

First Stop Prior to Facility by Distance

Distance	Number of Stops
Less than 20 miles	0
20-50 miles	0
50-150 Miles	0
Longer Than 150 Miles	0

First Stop After Facility by Distance

Distance	Number of Stops
Less than 20 miles	0
20-50 miles	0
50-150 Miles	0
Longer Than 150 Miles	0

2 Estimate Peak Occupancy - 2-Digit NAICS Code

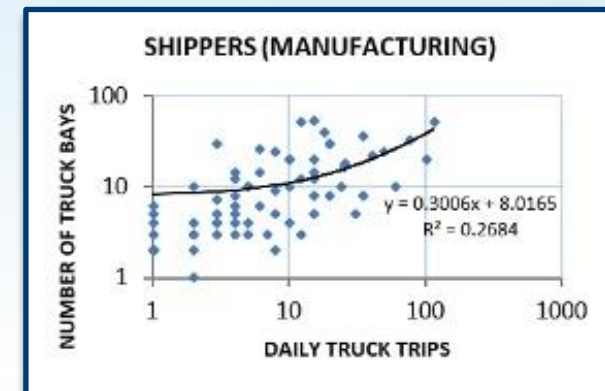
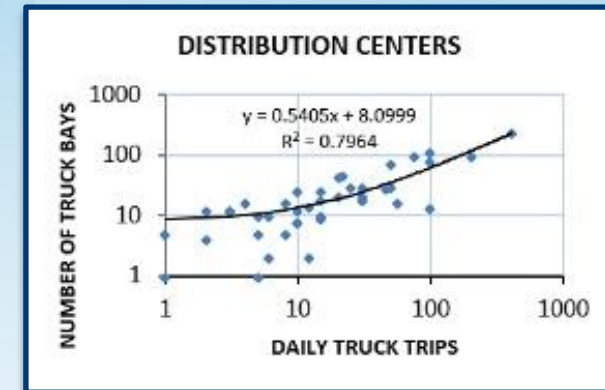
2-Digit NAICS

Estimation Tool | ReadMe | Parameters - Distance | Parameters - Linear Model 1 | +

Source: Cambridge Systematics.

Case Studies on Truck Parking Demand Estimation

- **National Cooperative Freight Research Program (NCFRP) Research Report 37: *Using Commodity Flow Survey Microdata and Other Establishment Data to Estimate the Generation of Freight, Freight Trips, and Service Trips: Guidebook*, 2016**
- **Maricopa County Association of Governments (MAG) Truck Parking Study, 2021**
- **Winston-Salem Innovations in Local Freight Data**
- **Texas A&M Transportation Institute (TTI) Truck Trip and Truck Parking Generation Study, 2021**
 - » Houston, Dallas, and San Antonio, Texas
 - » Salisbury and Hagerstown, Maryland

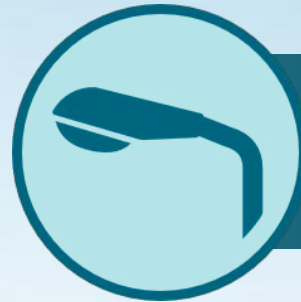


Source: Winston-Salem MPO, 2016.

Desired Safety Features of Truck Parking Facilities



***INGRESS AND EGRESS
RAMPS OF
SUFFICIENT LENGTH***



SUFFICIENT LIGHTING



***SECURITY CAMERAS
OR LOT
ATTENDANTS***



***SITE DESIGN
ALLOWING EFFICIENT
FLOW OF TRAFFIC***



***FENCING OR OTHER
BARRIER SURROUNDING
THE LOT***



SECURE BATHROOMS

Source: Cambridge Systematics.



Discussion of Community Impacts of Truck Parking

BENEFITS

- Enhances roadway and driver safety
- Reduces unauthorized parking
- Reduces roadway maintenance costs
- Increases competitiveness

CONCERNS

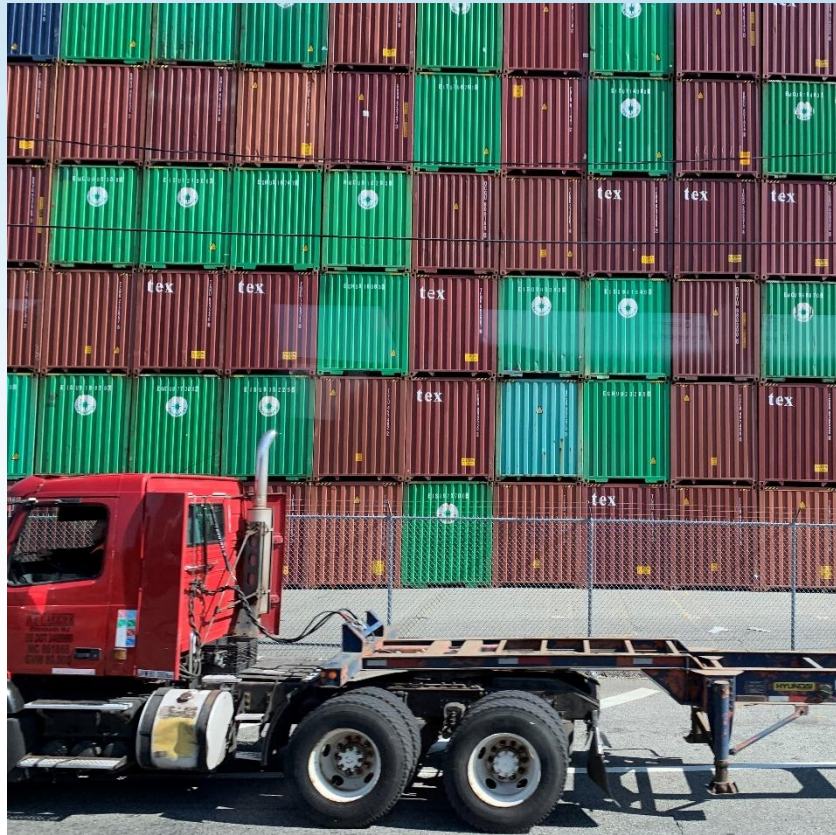
- Noise
- Emissions
- Community safety
- Trash and litter
- Low revenue generation
- Community perception



Mitigating Community Impacts of Freight Intensive Land Uses

- Avoid sites near residential land uses, schools, and other community amenities.
- Co-locate with existing industrial developments.
- Prioritize locations directly adjacent to major highways.
- Assess the ability of access roadways to accommodate large trucks.
- Consider how truck traffic may impact other critical transportation services.
- Evaluate how siting choices will positively or negatively impact the equitable distribution of transportation externalities.





Freight Data under the Bipartisan Infrastructure Law



Freight Data Needs for Freight Planning in the Bipartisan Infrastructure Law (1/2)

Section	Topic	Requirement	Possible Data Source	Data Gap
49 U.S.C. 70202	State Freight Plan	Commercial motor vehicle parking facilities assessment	Truck parking surveys	-
49 U.S.C. 70202	State Freight Plan	Areas with a shortage of adequate parking and underlying causes	Truck Parking Development Handbook Truck GPS data	
49 U.S.C. 70202	State Freight Plan	Supply chain cargo flows by mode of transportation	Freight Analysis Framework (FAF)	-
49 U.S.C. 70202	State Freight Plan	Commercial ports	U.S. Army Corps of Engineers Waterborne Commerce Statistics	-
49 U.S.C. 70202	State Freight Plan	E-commerce	-	E-commerce impacts on demand and delivery
49 U.S.C. 70202	State Freight Plan	Military freight	Strategic Highway Network (STRAHNET)	-
49 U.S.C. 70202	State Freight Plan	Impacts of extreme weather and natural disasters on freight mobility	Federal Emergency Management Agency (FEMA) After Action Reports	-
49 U.S.C. 70202	State Freight Plan	Impacts of freight movement on local air pollution	Environmental Protection Agency (EPA) Motor Vehicle Emission Simulator (MOVES)	-
49 U.S.C. 70202	State Freight Plan	Impacts of freight movement on flooding and stormwater runoff	-	Hydrology impacts of freight infrastructure
49 U.S.C. 70202	State Freight Plan	Impacts of freight movement on wildlife habitat loss	-	Wildlife data

Freight Data Needs for Freight Planning in the Bipartisan Infrastructure Law (2/2)

Section	Topic	Requirement	Possible Data Source	Data Gap
23 U.S.C. 117	Infrastructure for Rebuilding America (INFRA) eligible projects	Wildlife crossing	-	Wildlife data
23 U.S.C. 117	INFRA eligible projects	Throughput efficiency of border crossings	Customs and Border Protection Border Wait Times	-
23 U.S.C. 117	INFRA additional considerations	Freight resilience to natural hazards or disasters	-	Natural disaster effects on freight
23 U.S.C. 117 23 U.S.C. 167	INFRA & National Highway freight Program (NHFP) eligible projects	Marine project to reduce on-road mobile source emissions	Environmental Protection Agency (EPA) Motor Vehicle Emission Simulator (MOVES)	-
23 U.S.C. 175	Carbon Reduction Program (CRP) eligible projects	Efforts to reduce environmental and community impacts of freight movement	EPA MOVES Federal Highway Administration (FHWA) Traffic Noise Model (TNM) FHWA Database for Analysis of Noise and Air Quality (DANA) tool	-
BIL 11402 (23 U.S.C. 149 note)	Reduction of truck emissions at port facilities	Reducing emissions at ports and intermodal transfer facilities	EPA MOVES	-
Other	-	Complete streets, curb space, last-mile delivery	-	Freight impact on local roads

How Is FHWA Using Freight Analytics?

Existing Data and Tools

FAF

Truck Parking

Freight Mobility Trends

Highway Performance Monitoring System (HPMS)

National Performance Management Research Data Set (NPMRDS)

New Research

Vehicle Inventory and Use Survey (VIUS)

TSW Research Roadmap

Freight Fluidity

National Behavior-Based Freight Model

Freight Traveler Information Systems

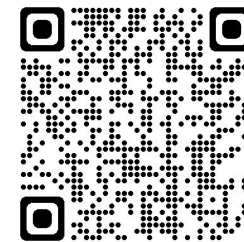


Infrastructure Conditions and Performance

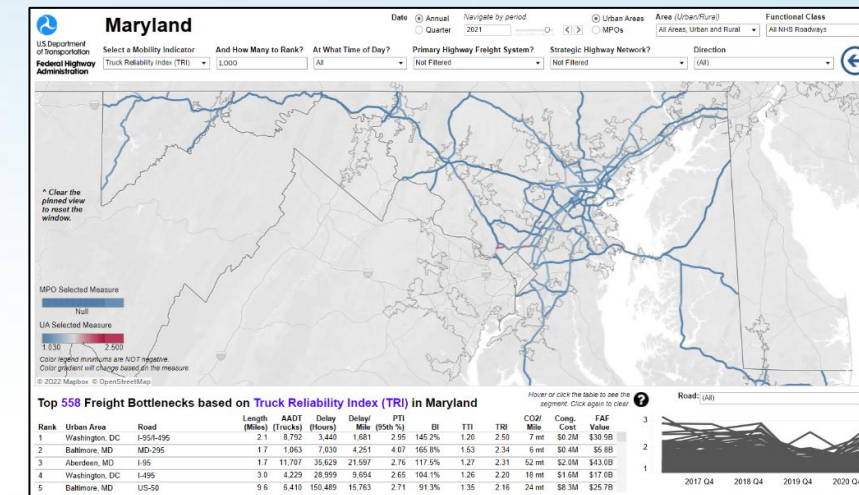
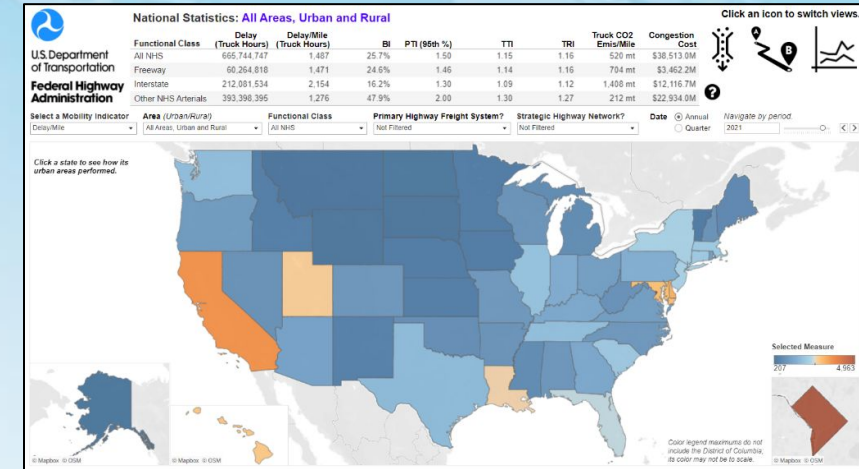


Freight Mobility Trends and Performance

- National goals and performance management measures for freight movement under 23 U.S.C. 150, including truck travel time reliability (TTTR)
- Freight mobility trends:
 - Freight mobility performance indexes
 - Truck carbon dioxide (CO₂) emissions
 - Freight bottlenecks
- Methods to improve freight reliability and bottlenecks:
 - Freight-related transportation systems management and operations (TSMO)
 - Congestion at bottlenecks
 - Performance-based planning process



Freight Mobility Trends: https://ops.fhwa.dot.gov/freight/freight_analysis/mobility_trends



Source: FHWA Freight Mobility Trends.

Conditions and Performance (C&P) Report to Congress

24th Edition NHFN C&P Indicators by National Goal Areas

- The C&P Report includes several indicators of conditions, performance, and safety.
- The last published edition (24th) also included information on National Highway Freight Network (NHFN) trends, FHWA initiatives relating to NHFN data improvements, and other topics.

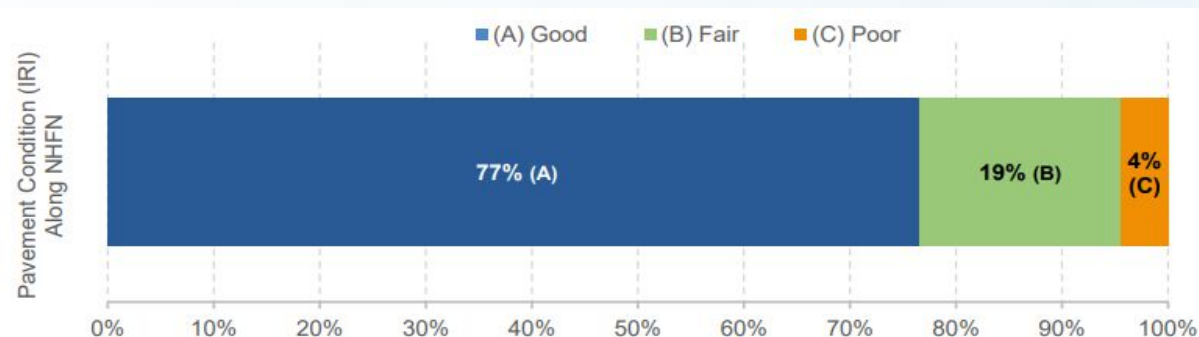
NHFP Goal Areas Pertinent to NHFN	Select Indicator	Indicator Type
State of Good Repair	Pavement condition	Conditions
	Overall ride quality and ride quality by roadway functional class	
	Individual pavement distresses	
	Bridge overall condition and condition by roadway functional class	
	Bridge deck condition	
	Bridge superstructure condition	
	Bridge substructure condition	
Congestion, Economic Efficiency, Productivity, and Competitiveness	Peak-period congestion on National Highway Freight Network (NHFN)	Performance
	Peak-period congestion on high-volume truck portion of NHFN	
	Annual average travel speeds for top 25 domestic freight corridors	
	Travel time reliability index for top 25 domestic freight corridors	
Safety, Security and Resilience	Number of fatal crashes and fatalities	



C&P Highlights: Condition

- Most NHFN mileage was in “good” condition (assessed in terms of overall ride quality and individual pavement distresses).
- NHFN interstates had most mileage rated “good” for ride quality, while minor collectors had least mileage rated “good” for ride quality.
- More than half of NHFN bridges (53 percent) had a “good” overall condition rating.

NHFN Pavement Condition Based on International Roughness Index, 2016



Note: NHFN is National Highway Freight Network; IRI is International Roughness Index. With the inclusion of the CRFCs and CUFCs submitted as of May 1, 2018, the total mileage of the NHFN is 54,310.

Source: Highway Performance Monitoring System, 2016.

CRFC = Critical Rural Freight Corridors
CUFC = Critical urban Freight Corridors

C&P Highlights: Performance

- Most recurring, highly congested conditions on NHFN occurred in major metro areas:
 - High-volume truck portions of NHFN experienced more congested conditions.
- Between 2011 and 2016 for the top 25 domestic freight corridors on the NHFN:
 - Annual average travel speeds generally increased*
 - Truck travel reliability generally decreased**
- Fatal crashes on the NHFN increased from 2014 (3,633) to 2016 (4,447)

Peak-Period Congestion on NHFN, 2015



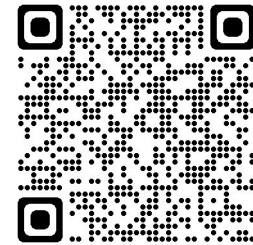
Source: FHWA, Office of Freight Management and Operations, FAF, version 4.3, 2016.

*52 percent of corridors experienced a speed increase over this period

** 72 percent of corridors experienced a decrease in truck travel reliability

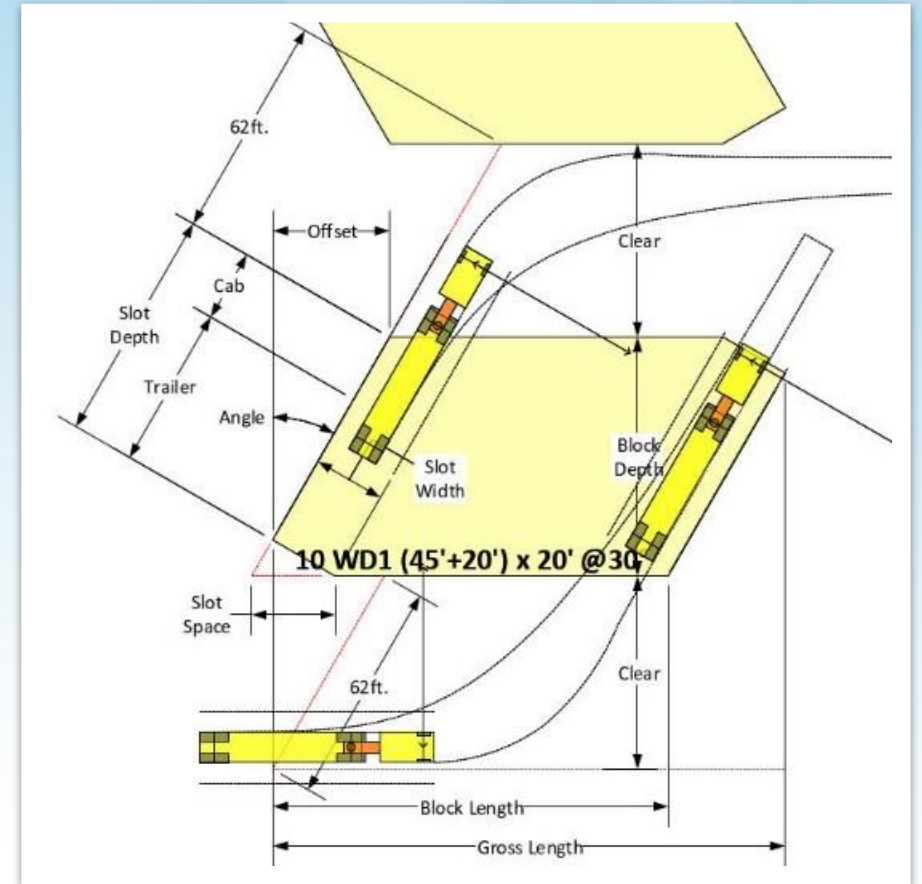
Truck Parking Development Handbook

- Presents tools and strategies for local planners and officials to integrate truck parking with freight land uses
- Provides tools for estimating truck parking generation and needs
- Identifies public benefits of truck parking and benefit cost and economic impact analyses
- Discusses factors for identifying sites and designing truck parking
- Examines attributes that ensure truck parking areas are safe
- Provides case studies of successful truck parking developments



Truck Parking Webpage:

https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking



Source: FHWA.



Freight Operations



Freight Analysis Framework (FAF)

What is moving?

- Types of commodities

Where is it moving?

- Between metropolitan areas
- Between States
- Between U.S. and foreign countries

How much is moving?

- Tons, ton-miles, and value of goods moved (including by truck, rail, air, and water)

How much is expected to move (flow scenarios)?

- Base year estimates
- 30-year forecasts

FAF Provides a Comprehensive Picture of Freight Movement in the U.S.

- Includes information on:
 - Weight and value of freight transported
 - Types of commodities & transport mode
 - Freight truck routings
- Offers tools to customize data for analysis
- Updated every 5 years in conjunction with economic census



Applications of FAF

FAF can help:

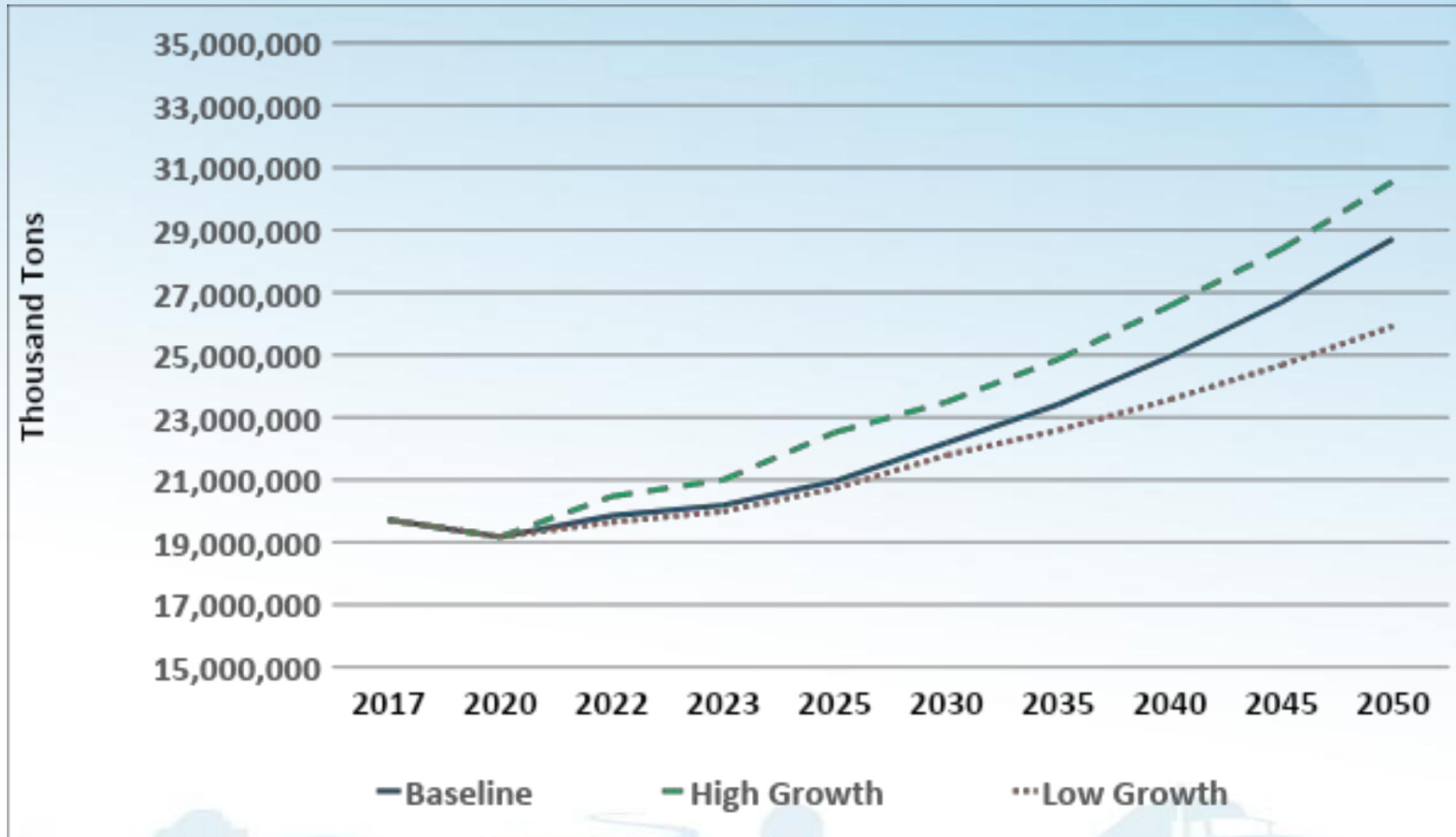
- Inform freight analysis and decisionmaking
- Improve understanding of current and projected future freight needs
- Enhance understanding of current and projected future freight movement
- Illuminate links between freight and economic activity
- Improve freight performance monitoring and management
- Better visualize freight flows and other freight data

Examples of FAF Use Cases:

- Support development of, or updates to, the State Freight Plan
- Help identify commodity corridors and trade lanes
- Provide control totals for modeling needs to understand State/regional freight connectivity
- Help conduct macro-level analysis for drafting grant applications



FAF Projected Total Flows by Growth Scenario



Source: USDOT, FHWA, Office of Freight Management and Operations, FAF, version 5.2.

Updates with Freight Analysis Framework Version 5 (FAF5)

Origin-Destination Flows

- New data base year (2017)
- Updated data to horizon 2050 with 5-year increments
- New short-term forecasts for 2020, 2022, and 2023
- Revised annual estimates for 2018 and 2019
- Updated base year data and forecast data development processes

Highway Network Flows

- Updated model highway network (dualized Interstates and included ramps)
- Added new truck flows by commodity groups
- Added new truck flows (domestic, imports, and exports)
- Overhauled highway network model and routing algorithms
- Added new customized model software and analysis capability

Special Products and Data Tools

- Updated features for web-based data products
- Added new FAF data visualization tools
- Added new national truck flow maps
- Added new State-level truck flow maps
- Added new summary tables by FAF zones
- Added a new special tabulation of CFS 2017 for small areas
- FAF Webinars

CFS = Commodity Flow Survey



New FAF5 Maps: Trucking Corridors by Commodity



Note: Major flows include domestic and international freight moving by truck on highway segments with more than 25 FAF trucks per day and between places typically more than fifty miles apart.
Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework (FAF), version 5.2.
Flows include Motorized vehicles (SCTG36) commodities represented in FAF.

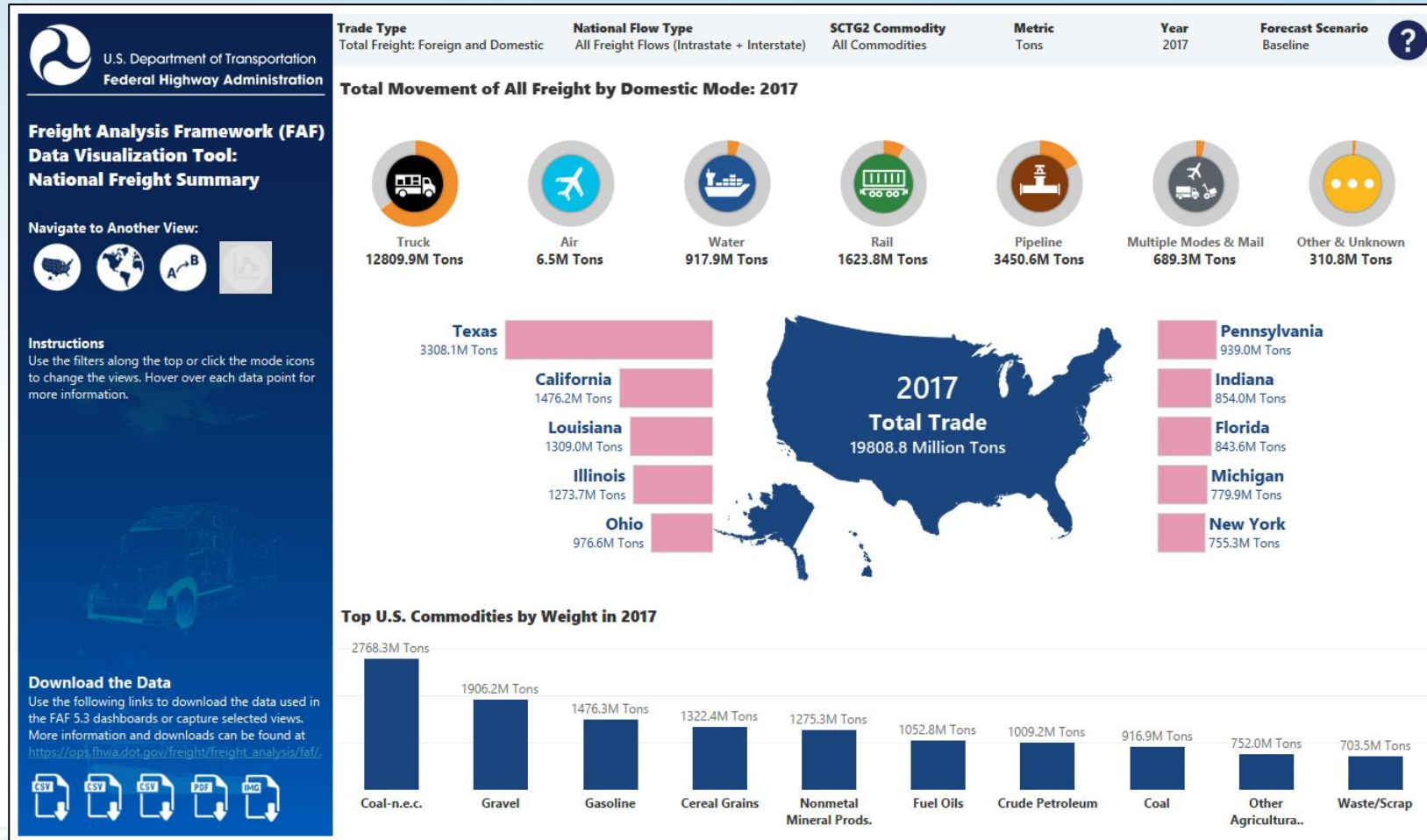
Source: FHWA.

Download Packaged National and State Level Trucking Corridor Maps:
https://ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/index.htm



New FAF5 Web Tool Specialized Visualization Dashboard

Custom Freight Dashboard: Release in 2023



Updated Features: Existing Web-Based Data Tool

Extraction

- Provides subset of data based on user selection

dms_orig	sctq2	dms_mode	dist_band	thousand tons in 2017
06-California	02-Cereal grains	1-Truck	1-Below 100	2,571.7
06-California	02-Cereal grains	1-Truck	2-100 - 249	2,685.5
06-California	02-Cereal grains	1-Truck	3-250 - 499	3,839.6
06-California	02-Cereal grains	1-Truck	4-500 - 749	28.5
06-California	02-Cereal grains	1-Truck	5-750 - 999	126.6
06-California	02-Cereal grains	1-Truck	6-1,000 - 1,499	145.8
06-California	02-Cereal grains	1-Truck	7-1,500 - 2,000	10.3

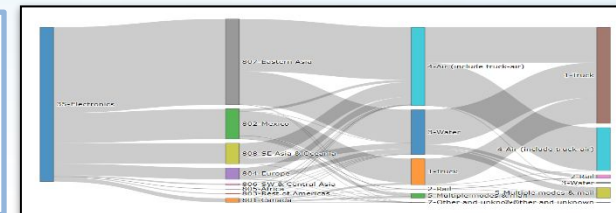
Tabulation

- Provides ability to further customize tabulation of the selected subset data.

dms_orig	dms_dest	009-Rest of CA	006-San Fran	0-San Diego CA	002-Sacramento CA	005-Fresno CA	Totals
009-Rest of CA	006-San Fran	21.6	965.7	41.8	140.8	149.0	3,628.5
009-Rest of CA	0-San Diego CA	33.2	70.8	128.2	12.6	2.8	1,842.7
002-Sacramento CA	006-San Fran	836.7	209.3	64.1	48.3	3.5	1,705.5
002-Sacramento CA	0-San Diego CA	1.5	77.0	31.2	118.6	0.1	0.6
005-Fresno CA	006-San Fran	93.0	42.6	3.3	1.7	1.0	141.6
Totals		4,147.7	1,870.0	1,854.5	360.2	339.9	239.5

Visualization

- Provides ability to create bar/pie charts, Sankey diagrams, origin-destination flow maps, etc.



Source: USDOT, FHWA, Office of Freight Management and Operations, FAF, version 5.3.

Custom Summary Tables on the Web
https://faf.ornl.gov/faf5/dtt_total.aspx

FAF5 User Resources and Tools

FAF Main Page

- https://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm

Pre-Populated Tables

- <https://faf.ornl.gov/faf5/SummaryTable.aspx>

Pre-Populated Maps

- National maps: https://ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/index.htm
- State maps: https://ops.fhwa.dot.gov/freight/freight_analysis/state_info/index.htm
- Future years maps under publication review

Truck Flow Data

- FAF Highway Assignment Results Section: https://ops.fhwa.dot.gov/freight/freight_analysis/faf/

Web Based Tool

- Summary Tabulation Tools: https://faf.ornl.gov/faf5/dtt_total.aspx
- Visualization Tool for Dashboard: Under Development (release by March 2023)

Documents

- Latest FAF Technical Documents section: https://ops.fhwa.dot.gov/freight/freight_analysis/faf/
- FAF Forecast Report: Under Publication review

Webinars

- FAF5 Webinar July 2022: Overview of FAF5 Base Year Data and Forecast Data
https://ops.fhwa.dot.gov/freight/freight_analysis/faf/faf5/FAF5FHWAWebinarJuly282022final.pdf
- FAF5 Webinar: Overview of Highway network Assignment Model: October 20, 2022

Vehicle Inventory and Use Survey (VIUS)

What type of trucks are included?

- Pickups
- Sport utility vehicles (SUVs)
- Minivans
- Light Vans
- Straight Trucks
- Truck Tractors

Examines Physical and Operational Characteristics of Trucks Registered in the U.S.

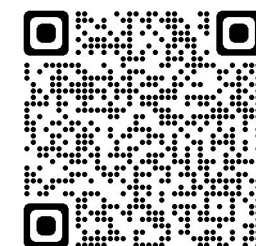
- Includes information on:
 - Vehicle technologies and configurations
 - Vehicle operations and commodities carried
- VIUS webpage: <https://www.bts.gov/vius>

What is the most recent data?

- VIUS 2021 is completed – data release by Fall 2023

When was the last VIUS completed?

- Latest available VIUS data is for year 2002; Summary reports in PDF format



New VIUS Web Tool: Specialized Visualization Dashboard

Increase Data Access and Create Custom Summary: Release in 2023

Vehicle Inventory Use Survey (VIUS)
Navigate to Other Views

Operational & Trip Attributes

Instructions
 Hover over the plus signs (+) to view the VIUS attribute to which the marker corresponds. Click on the plus sign (+) to view the data in the table to the right. Use the filters above the table to alter the table.

Months Operated

Range of Operation

Annual Miles

National/State
National

Truck Type & Vehicle Size
All Vehicles

Metric
Trucks (000)

Business: National

	1992	1997	2002
Agriculture	3,554.6	3,377.8	
Forestry/Lumbering	264.5	276.7	
Agriculture, Forestry, Fishing, or Hunting			2,239.9
Mining or Quarrying	220.4	250.6	
Mining			177.6
Utilities	541.2	663.8	679.3
Construction	4,986.3	6,033.9	4,541.5
Manufacturing	786.7	729.4	782.9
Wholesale Trade	1,136.1	1,264.6	735.9
Retail Trade	1,950.9	2,243.8	1,530.5

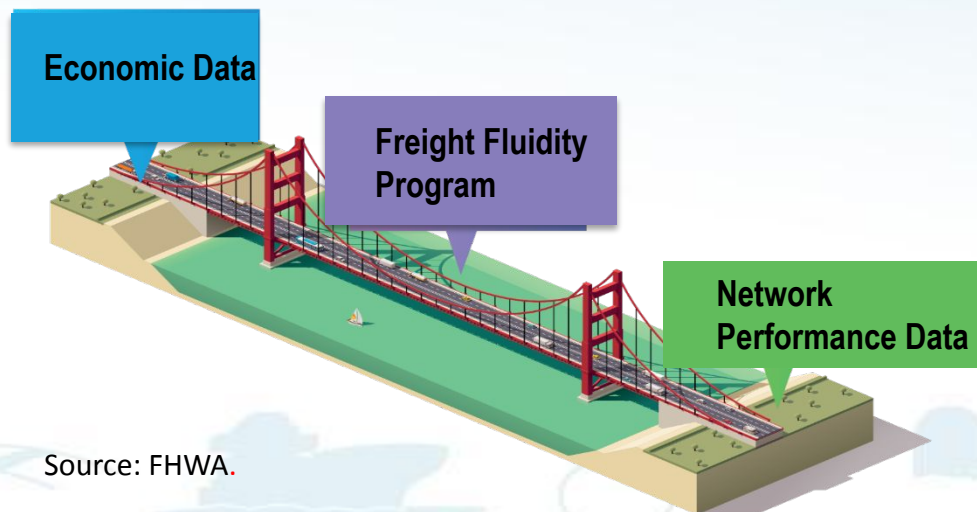
Note: Year to year comparisons are not recommended. Comparability of estimates may vary across survey years due to changes in category definitions. Values within a single year may not be mutually exclusive and may not sum to equal the total number of survey observations. Comparability of estimates may vary across survey years due to changes in category definitions. Graphic does not represent all truck types survey; for illustrative purposes only.

Download the Data and Views

Use the icons to the right to download the data or capture images used in this view. For more information about VIUS, data documentation, and other FHWA freight products, visit <https://www.bts.gov/VIUS>

Freight Fluidity: Advancing Multimodal Measures

- Bring a multimodal perspective to freight performance measurement
- Assess end-to-end performance of an individual freight trip or shipment moving across multiple modes and jurisdictions
- Support strategic transportation system investments that directly improve supply chain performance and economic competitiveness



Source: FHWA.



Source: FHWA.

Tracking Cross-Border Mobility: Truck Volume and Crossing Time Data

Border Wait Time Information

- Vehicle speed and travel time data collected at approach to border crossing
- Provide drivers with information on delay at border crossing

Benefits

- Drivers schedule border crossings to avoid congestion
- Truck drivers directed to parking areas when weather creates long delays

Limitations

- Systems and data not consistently implemented at all border crossings

Freight Traveler Information Systems

- Freight-specific dynamic travel planning and performance using real-time information on:
 - Gate wait times at port
 - Traffic conditions, incident alerts, work zones
 - Performance monitoring elements
- Intermodal drayage operations optimization using freight information exchange systems drayage and container load matching to:
 - Schedule best time for pick-up or drop-off
 - Optimize operations based on port terminal conditions



Source: FHWA.



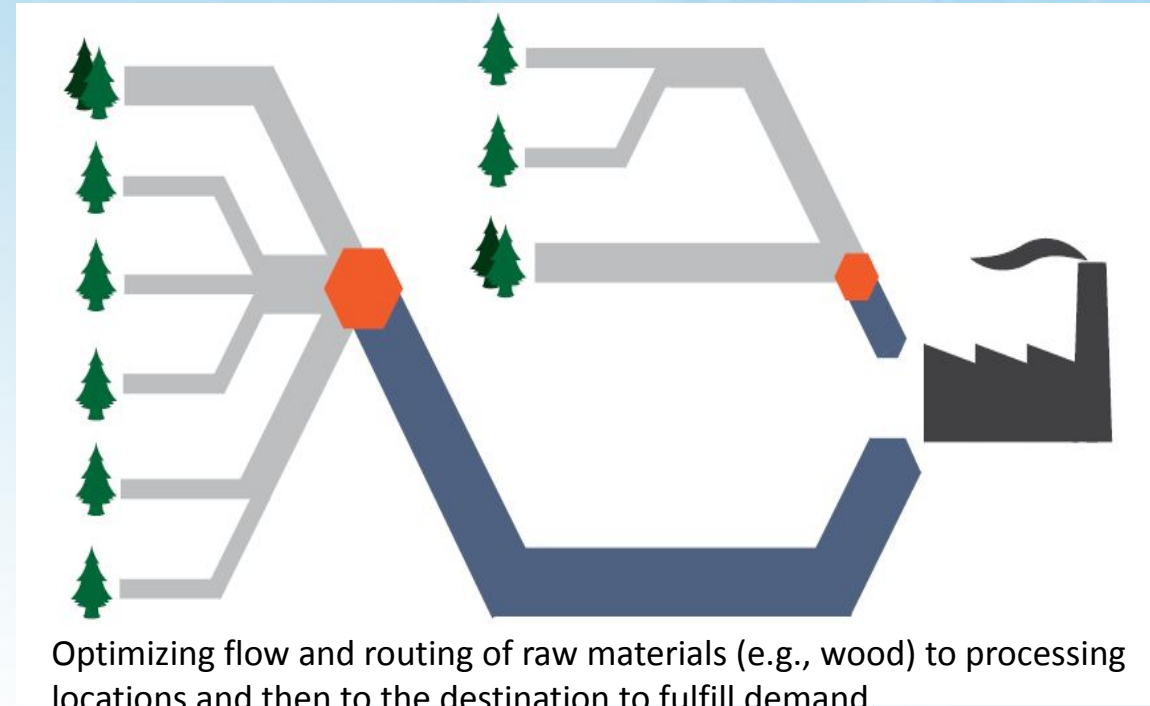
FHWA Pilot of Freight and Fuel Transportation Optimization Tool (FTOT)

FTOT Overview:

- Flexible scenario testing tool
- Created by the Volpe Center in support of the Federal Aviation Administration, Department of Energy, and the Office of Naval Research
- Being considered for adaptation to freight planning

FTOT Features:

- Optimizes routing and flows to maximize delivery and minimize cost
- Uses a Geographic Information System (GIS) module and an optimization module
- Multimodal network: road, rail, waterway, pipeline, multimodal facilities

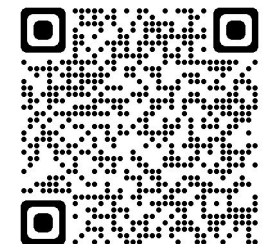


Optimizing flow and routing of raw materials (e.g., wood) to processing locations and then to the destination to fulfill demand.

Source: Dane Camenzind, Washington State University, used with permission

FTOT Available at:

<https://github.com/VolpeUSDOT/FTOT-public>



FTOT Explores Optimal Solutions to Freight Scenario Questions

Multimodal Transportation Infrastructure

What happens if...

- Transportation link(s) are added or removed (e.g., bridge)?
- Infrastructure is added or removed (e.g., inland port, intermodal facility)?
- Key node(s) get knocked out due to a disruption (e.g., a flood)?

Supply Chain/Industry Infrastructure

What happens if...

- Supply chain facilities change (e.g., new storage facility, mill, refinery)?
- Steps in the supply chain change (e.g., new processing step)?
- FTOT generates candidate facilities along the supply chain (e.g., processors)?

Demand and Supply

What happens if...

- Supply of material changes (e.g., more production)?
- Facility attributes change (e.g., expand capacity) to permit more or less flow?
- Demand changes (e.g., City X wants more of a commodity than City Y)?





New Tools and Training



Freight Professional Capacity Building (FPCB) Program Website

- Freight data library
- Freight data tools
- Freight planning toolkits
- Freight performance measures
- Innovative supply chain analyses
- TSW resources
- Peer-to-peer programs
- Noteworthy practices
- Education and trainings



FPCB Webpage: <https://fpcb.ops.fhwa.dot.gov/default.aspx>

The screenshot shows the homepage of the Freight Professional Capacity Building Program website. At the top, it identifies the United States Department of Transportation and the Federal Highway Administration. The main heading is 'OFFICE OF OPERATIONS: Freight Management and Operations FREIGHT PROFESSIONAL CAPACITY BUILDING PROGRAM'. A navigation bar includes links for HOME, PEER ASSISTANCE, NOTEWORTHY PRACTICES, EDUCATION & TRAINING, DATA & TOOLS, and PLANS & PROGRAM AREAS. The main content area features a large banner with a green truck and the text 'Welcome to the Freight Professional Capacity Building Program Website'. Below this are three featured sections: 'State Freight Planning Resources' (with an image of a port), 'Truck Size and Weight Resources' (with an image of a red truck), and 'Find Professional Freight Training' (with an image of people in a warehouse). A blue section titled 'About Us' explains the program's goal and includes a 'Sign up for Updates' button with a bell icon. At the bottom, there are three more sections: 'Talking Freight' (a monthly webinar archive), 'Freight Performance Measures' (resources for setting targets), and 'Explore Innovative Supply Chains' (resources for the Freight Fluidity program).

Freight Data on FPCB

- Freight data tools
 - FAF5 Data Tabulation Tool
 - NHFN Visualization Tool
 - Freight Mobility Trends Tool
- Freight data library
 - Freight Conditions & Performance
 - Freight Facts and Figures
 - Economic Data
 - Energy/Resiliency
 - Freight Data Classification Systems
 - Freight Flows
 - General Transportation Data
 - Trade Data
 - Transportation System Activity Data
- Innovative Supply Chain Analysis




OFFICE OF OPERATIONS: Freight Management and Operations
FREIGHT PROFESSIONAL CAPACITY BUILDING PROGRAM

HOME | PEER ASSISTANCE | NOTEWORTHY PRACTICES | EDUCATION & TRAINING | DATA & TOOLS | PLAN & PROGRAM AREAS


Freight Data Tools

Freight data comes from a variety of sources and often presents a major hurdle in completing freight performance and policy analyses. The tools on this page have been developed by the Federal Highway Administration and other federal organizations to help users gain quicker insights into freight data.




Freight Analysis Framework (FAFS) Data Tabulation Tool
Designed to allow users to create and download summary tables directly from the FAFS regional database. The user can select one or more elements from each category to generate a customized data set on demand and download the resulting CSV output data set for further analysis.

[USE TOOL](#) [LEARN MORE](#)



National Highway Freight Network (NHFN) Visualization Tool
This map-based tool allows users to view components of the NHFN on a state-by-state or national basis to learn more information about key freight corridors and their performance across the system.

[USE TOOL](#)



Freight Mobility Trends Tool
This is an interactive dashboard that presents national freight statistics and identify freight highway bottlenecks on the Interstate System, National Highway System (NHS), Primary Highway Freight System (PHFS), and Strategic Highway Network (STRAHNET). It analyzes trends for different freight mobility measures at the national, state, and MPO level and along specific corridors, at bottleneck locations, ports, and intermodal facilities.

[USE TOOL](#) [LEARN MORE](#)

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration
1200 NEW JERSEY AVENUE, SE
WASHINGTON, DC 20590
202-366-0408

Staff Contact
Tiffany Julien, Transportation Specialist
FHWA Office of Freight Management and Operations
Tiffany.Julien@dot.gov
(202) 366-6241

FPCB Webpage: <https://fpcb.ops.fhwa.dot.gov/default.aspx>

Source: FHWA.

National Highway Freight Network (NHFN) Visualization Tool

NATIONAL HIGHWAY FREIGHT NETWORK

The NHFN includes four subsystems of roadways for an estimated total of 58,654 centerline miles.

Primary Highway Freight System (PHFS)

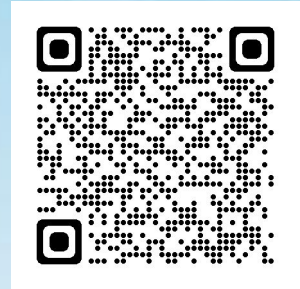
- This is a network of highways identified as the most critical highway portions of the U.S. freight transportation system determined by measurable and objective national data.
- Source: Designated PHFS, shapefile uses original features developed from the 2012 HPMS data.

Other Interstate Portions not on the PHFS (Non-PHFS Interstates)

- These highways consist of the remaining portion of Interstate roads not included in the PHFS. These routes provide important continuity and access to freight transportation facilities.
- Source: All Interstates that are not designated at PHFS, shapefile uses 2017 HPMS data.

FID	YEAR_RECOR	VERSION	STATE_CODE	ROUTEID	BEGMP	ENDMP	NHFN_CODE	SIGN1	SIGNT1	SIGNN1	LNAME	NHS	SOURCE	ST_NAME
4901	2019	2022.09.13	39	SALLIR00075**C	0.000000	23.121000	1	I75	I	75		1	ARNOLD_Ohio_2	Ohio
4902	2019	2022.09.13	39	SCLAIR00070**C	0.000000	29.252000	1	I70	I	70		1	ARNOLD_Ohio_2	Ohio
4903	2019	2022.09.13	39	SCLIIR00071**C	0.000000	15.393000	1	I71	I	71		1	ARNOLD_Ohio_2	Ohio
4904	2019	2022.09.13	39	SFULIR00080*KC	0.000000	26.260000	1	I80	I	80		1	ARNOLD_Ohio_2	Ohio
5205	2019	2022.09.13	21	076-I-0075-000	73.408000	97.703000	1	I75	I	75		1	ARNOLD_Kentuck	Kentucky
5983	2019	2022.09.13	18	10000000740000	73.340000	151.261000	1	I74	I	74		1	ARNOLD	Indiana Indiana

1653 features 0 selected



Source: FHWA. Available on FPCB website: https://fpcb.ops.fhwa.dot.gov/tools_nhfn.aspx

Research Relating to Truck Size and Weight



Current Research (1/3)

DOT modal administrations are working to advance long-term Truck Size and Weight (TSW) research including:

- Updating critical information sources, such as expanding use of weigh-in-motion (WIM) technology
- Updating the Freight Analysis Framework (FAF), which integrates data from all modes of transportation to create a comprehensive picture of freight movement
- Re-establishing the Vehicle Inventory and Use Survey (VIUS), the Nation's principal dataset on physical and operational characteristics of the U.S. light and heavy truck population

What is Vehicle Size and Weight Research?

TSW research includes development of data, models, analytical tools, methodologies, and information sources that support analysis of topics such as:

- Pavement distress
- Freight flows
- Physical and operational characteristics of truck configurations
- Disaggregation of vehicle miles traveled based on truck classifications and weight

Current Research (2/3)

- Developing a pavement distress evaluation model and creating analytical tools based on vehicle classifications and weights
- Conducting the Large Truck Crash Causation Study to analyze safety implications from truck crashes
- Continuing to research impacts of commercial vehicles on bridges
- Advancing the Long-Term Pavement Performance Program with recent publications such as *Facilitating Analysts' Use of Traffic Data from the Long-Term Pavement Performance Program*
- Improving access to TSW data by creating and maintaining a TSW Enforcement Data portal on the USDOT Public Data Portal website



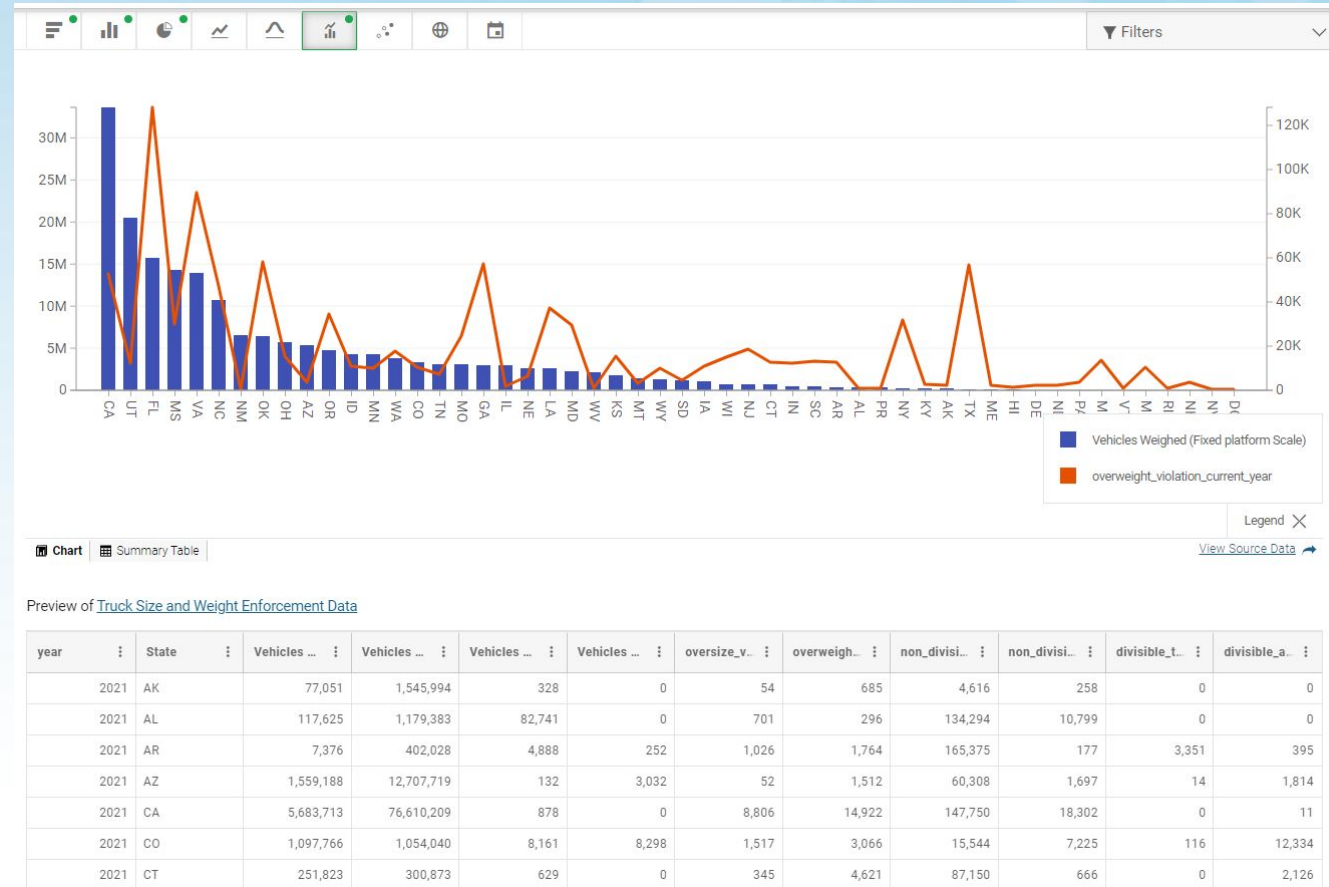
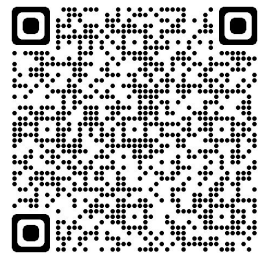
Current Research (3/3)

- Understanding oversize/overweight (OS/OW) vehicle accommodation in work zones
- Developing products from the recommendations of the Emergency Route Working Group to improve the routing of trucks responding to emergencies
- Researching methods to prevent bridge strikes by OS/OW vehicles
- Improving system performance by promoting automated permitting systems
- Evaluating data on the operation of twin 33-foot trailers in the United States to gain insight into potential impacts of this commercial vehicle configuration on the National Network



Annual TSW Enforcement Data

- Data reported by States in Annual Certifications is posted on USDOT's Data Hub.
- Dataset consists of TSW enforcement data for 2019 to 2021, including:
 - Number of trucks weighed
 - Number of violations
 - Number of oversize/overweight permits



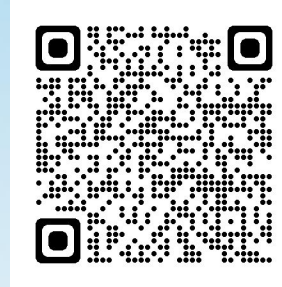
Source: FHWA.

<https://datahub.transportation.gov/Roadways-and-Bridges/Truck-Size-and-Weight-Enforcement-Data/mt5m-skz3>

Weigh in Motion (WIM) Data Sources

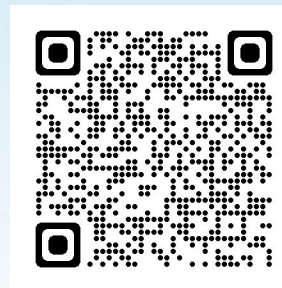
WIM Pocket Guide:

https://www.fhwa.dot.gov/policyinformation/knowledgecenter/wim_guide/



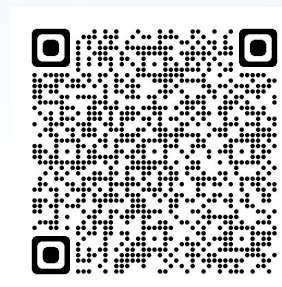
Traffic Data Computation Method Pocket Guide:

<https://www.fhwa.dot.gov/policyinformation/travelmonitoring.cfm>



Freight Facts and Figures:

<https://www.bts.gov/browse-statistical-products-and-data/freight-facts-and-figures/commercial-vehicle-weight>

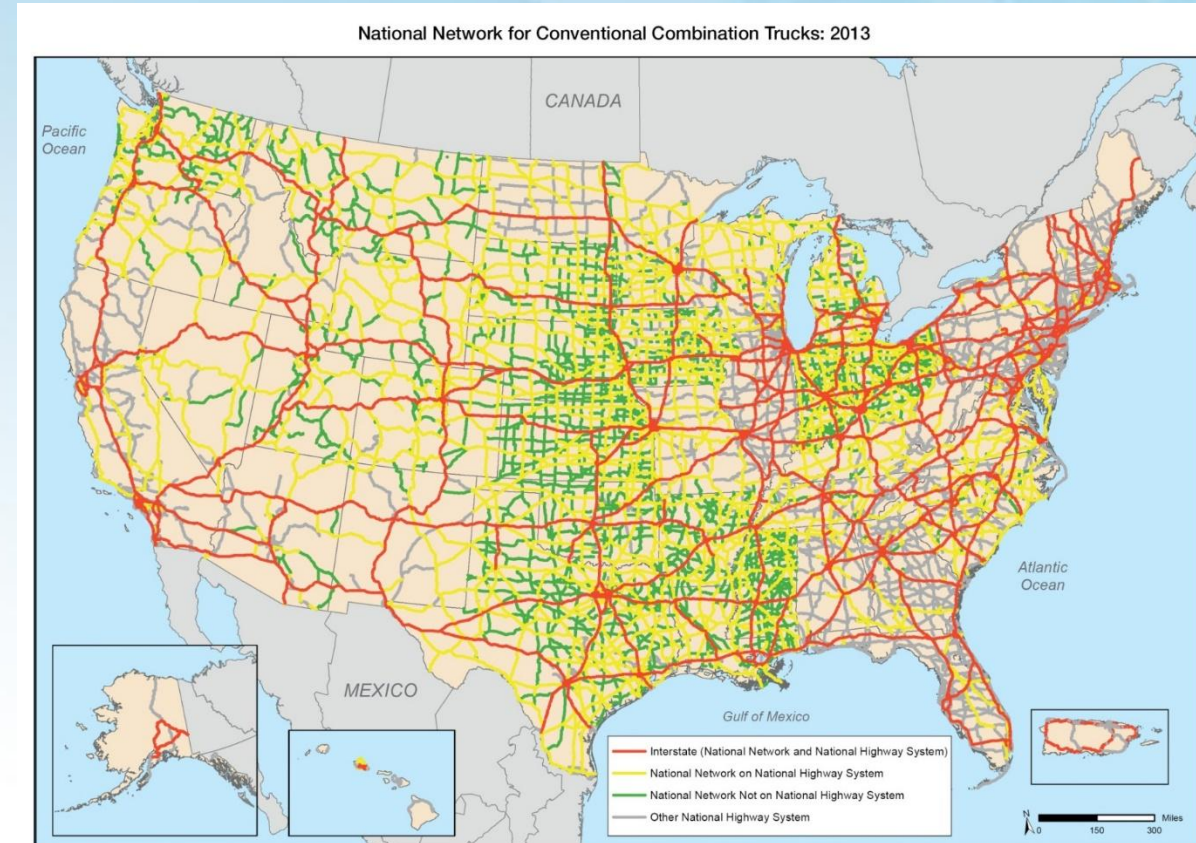


Source: FHWA.



National Network (NN)

- Federal width and length limits apply to the National Network, which includes:
 - Interstate Highway System
 - Federal-aid Primary Highway prior to June 1, 1991
 - Routes designated by States in 1991.
- NN is being reconciled through the FHWA Highway Performance Monitoring Program (HPMS).
- Additions and deletions to NN may require Notice of Proposed Rulemaking (NPRM) and comment period per 23 CFR 658.11.



Notes: This map should not be interpreted as the official National Network and should not be used for truck size and weight enforcement purposes. The National Network and the National Highway System (NHS) are approximately 200,000 miles in length, but the National Network includes 65,000 miles of highways beyond the NHS, and the NHS encompasses about 50,000 miles of highways that are not part of the National Network. "Other NHS" refers to NHS mileage that is not included on the National Network. Conventional combination trucks are tractors with one semitrailer up to 48 feet in length or with one 28-foot semitrailer and one 28-foot trailer. Conventional combination trucks can be up to 102 inches wide. Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, *Freight Analysis Framework*, version 3.4, 2013.

Source: FHWA.

Revitalized CVSA Emergency Declarations Website

- Jurisdictions may use emergency declarations to temporarily alter permit requirements for expedited delivery of emergency supplies.
- The FHWA, American Association of Highway and Transportation Officials (AASHTO), and Commercial Vehicle Safety Alliance (CVSA) implemented an emergency declarations website on CVSA's emergency webpage to provide:
 - information on allowable vehicle weights and permit requirements on the Interstate system during an emergency
 - information on changes to allowable weights and up-to-date emergency declarations
 - contact information for State overweight permitting offices



Source: CVSA.



Bridge and Tunnel Strike Mitigation

- Bridge strike data, reporting and tracking
 - Linking structure, roadway inventory, crash, traffic, and other databases
 - Risk-based, data-driven approach to evaluate bridge and tunnel strikes and develop crash prediction models
- Practices and systems for preventing bridge strikes
 - Passive systems—static signage, variable message signs, beacons/flashing signs, and bridge markings
 - Sacrificial systems—crash beams, hanging chains, and bells bars
 - Active systems—Intelligent Transportation Systems (ITS) and early warning detection systems
 - Detection systems—measure dynamic displacement of structure and transit warning to authorities
 - OS/OW permitting
 - Driver training
 - Vehicle-based technology

PIARC Special Project on Bridge and Tunnel Strikes by Oversize Vehicles

- International scan of countermeasures, practices, and technologies.

National Cooperative Highway Research Program (NCHRP) Study on Methods to Prevent Bridge Strikes by Trucks

- Countermeasures and systems for preventing bridge strikes.
- A framework for bridge strike data.



Source: Georgia Department of Transportation (DOT)



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