WIM 101
United States Network of Weigh In Motion (WIM) Systems

US Department of Transportation

Federal Highway Administration

Office of Highway Policy Information

Travel Monitoring and Surveys Section

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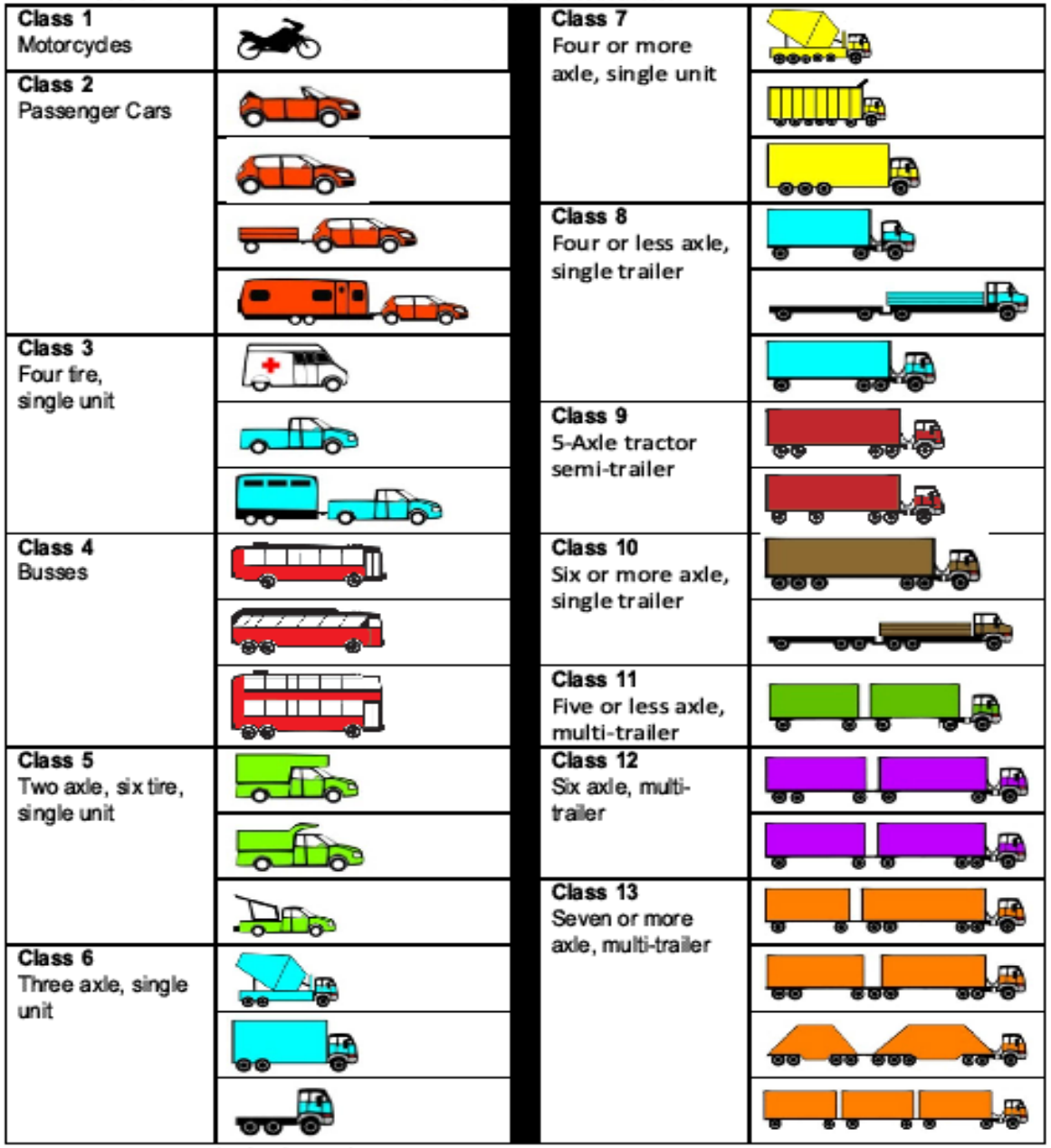
FHWA Classes of Vehicles

WIM Data Most Often Includes FHWA Classes 4-13

FIGURE A-1 FHWA 13 VEHICLE CATEGORY CLASSIFICATION

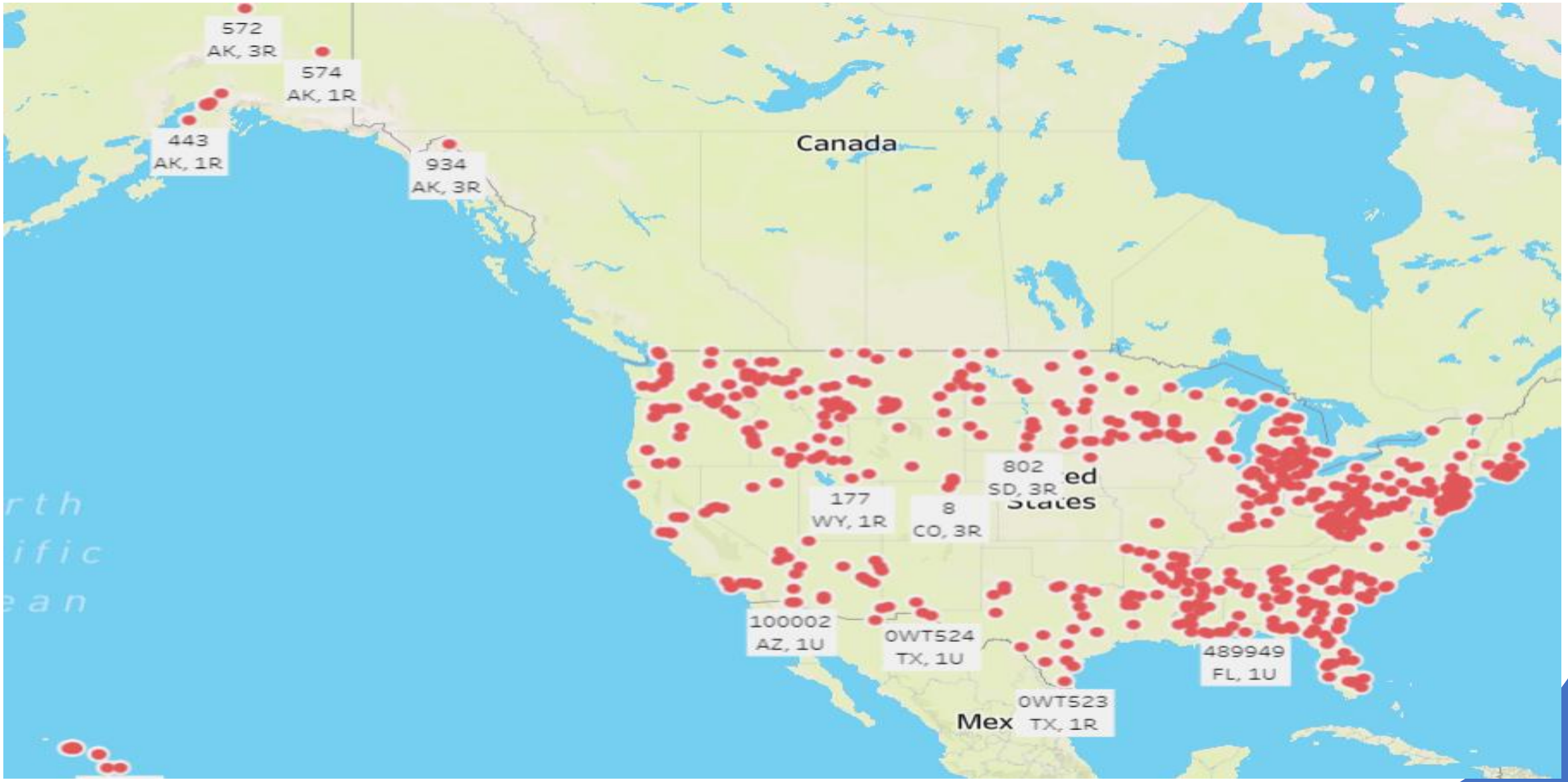


Source: Federal Highway Administration

Overview of US WIM Systems

- 745 WIM systems across the US with most Departments of Transportation (DOT) reporting data to FHWA through the Travel Monitoring Analysis System (TMAS)
  - 9 WIM sites are on functionally classified roads called minor arterial
  - More WIM sites are being installed by numerous state agencies
  - FHWA goal is to have WIM sites for every DOT agency in the US
- Data is reported by DOTs to FHWA every month through TMAS
- Data follows the FHWA Traffic Monitoring Guide (TMG) formats
  - 2001 TMG – weight and class formats
  - 2013 TMG – weight and class formats
  - 2022 TMG – weight, class and Individual Vehicle Record (IVR) preferred
- FHWA Long Term Pavement Program (LTPP) also is collecting WIM data for specific sites related to their research program.

Map of all US WIM sites in TMAS



Use of WIM Data

- FHWA **Highway Statistics**
- **Bridge Design**
- **Enforcement**
- FHWA **Freight Analysis Framework (FAF)** – national model of freight movement in the US
- **Highway Cost Allocation (HCA)** analysis and studies
- **Safety Uses** – stopping distances, acceleration lanes, high wind areas and runaway truck ramps
- FHWA **Database for Air Quality and Noise Analysis (DANA) Tool** – used for emissions and noise studies across the US
- **Geometric Design** - climbing lanes, turning radius, and other uses

List of WIM Uses From the 2022 TMG Table 1-1

Table 1-1. Examples of Highway Traffic and Travel Data Uses

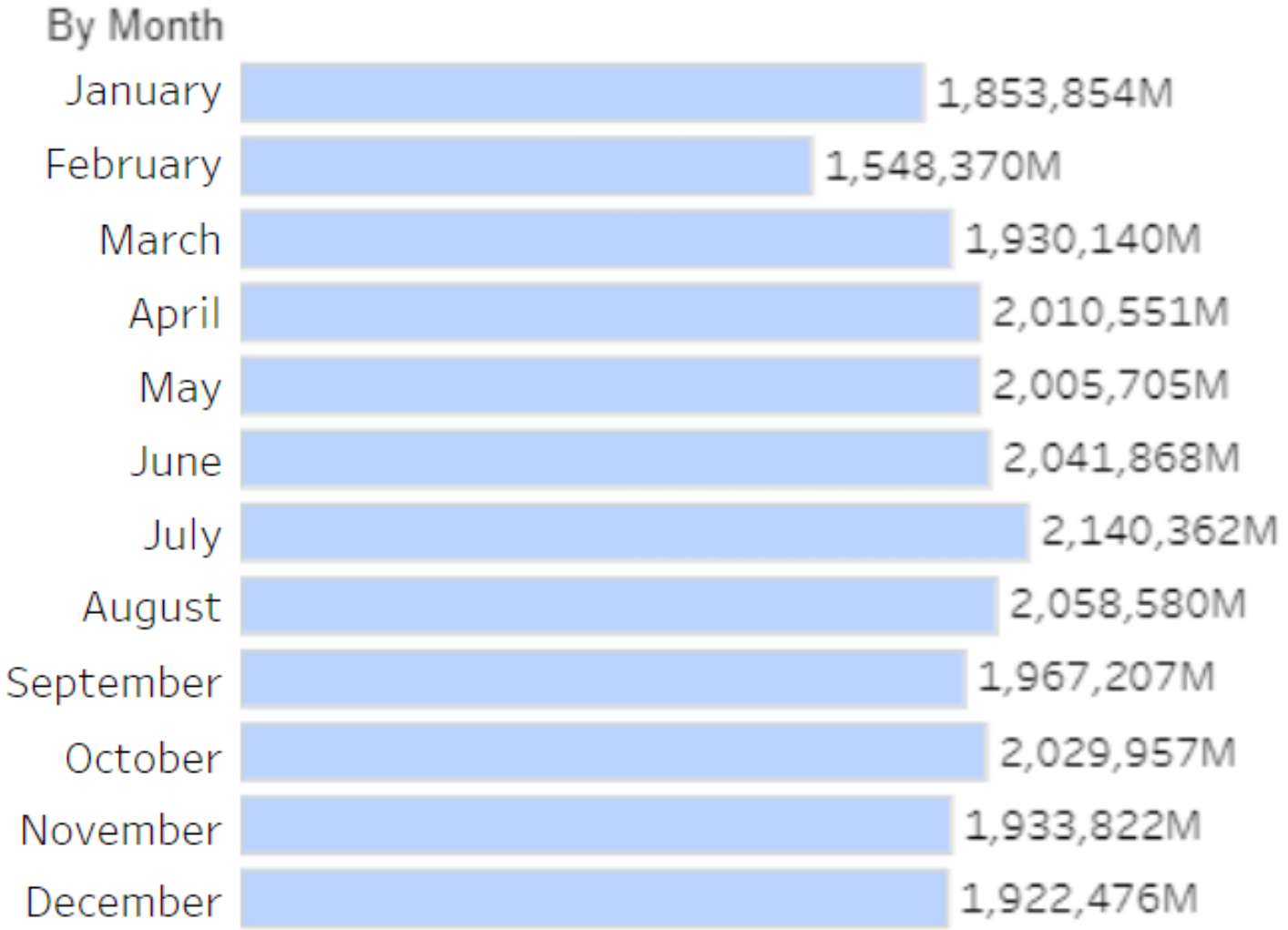
Highway Activity	Traffic Volume	Vehicle Classification	Vehicle Weight	Vehicle Speed
Design	Highway geometry	Pavement design, bridge design	Pavement design, bridge design, and monitoring	Highway geometry
Engineering Economics	Benefit of highway improvements	Cost of vehicle operation	Benefit of truck climbing lane	Costs associated with congestion
Finance	Estimates of highway revenue and toll revenue	Highway cost allocation	Highway cost allocation	User travel time costs
Legislation	Selection of highway routes	Speed limits and oversize vehicle policy	Changing weight limits on highways	Speed limits

[Traffic Monitoring Guide - Policy | Federal Highway Administration]

US Weight Summary Statistics

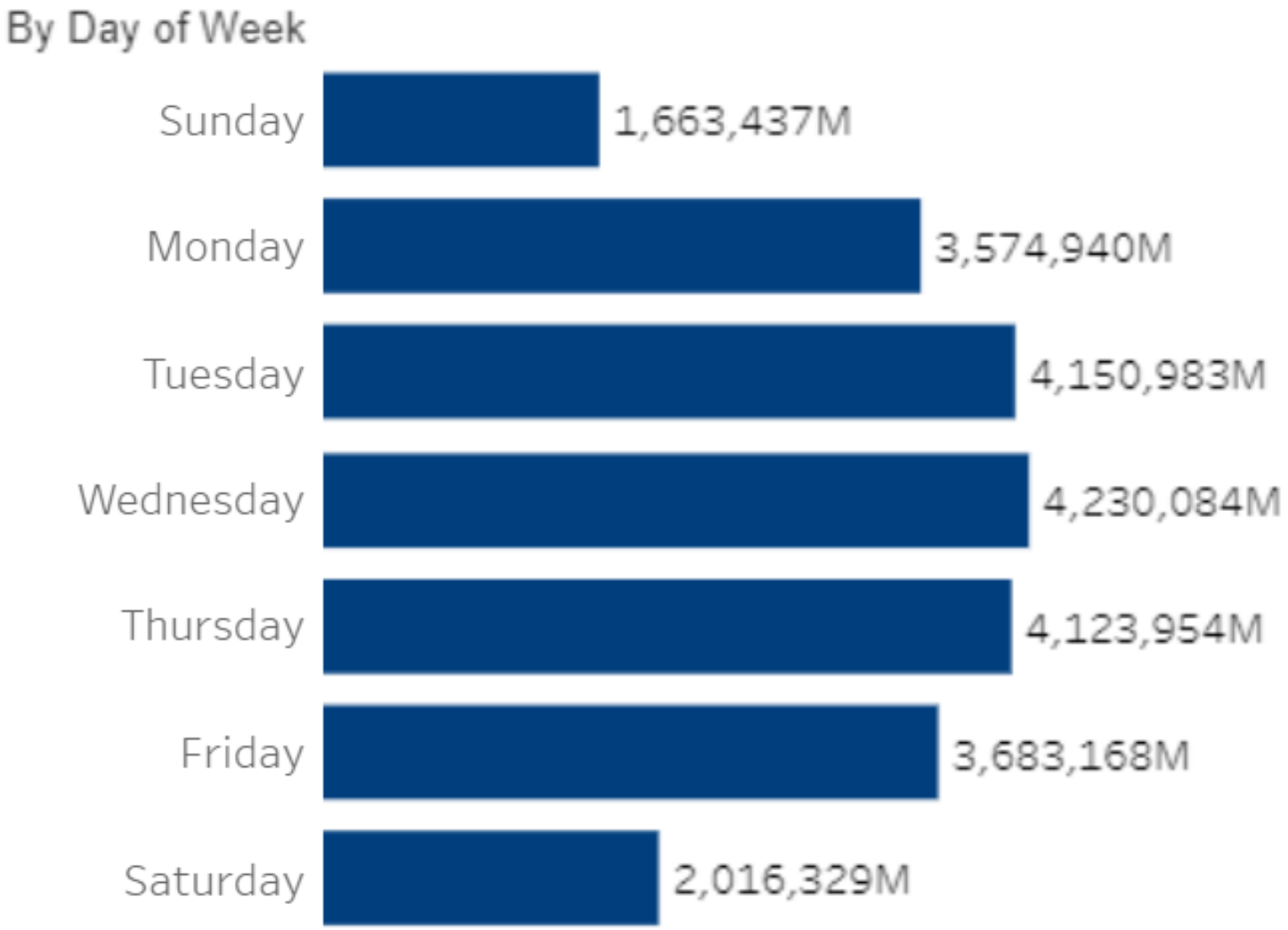
- Class 9 semitruck (18 wheels) front axle weight average is 4,942 kg or 10,895 lbs.
- Tandem spacing of all class 8-13 trucks is 1.35 meters or 4.43 feet
- For 2022 classes 5-13 single unit and combination trucks are 10.4% of the overall traffic stream a determined from vehicle miles traveled according to the Highway Statistics FHWA VM-1 national table.
- See the FHWA Highway Statistics website (PS-1, VM-1, VM-2, VM-4):
- Highway Statistics Series - Policy | Federal Highway Administration

Distribution of Trucks in the US by Month of Year by Weight



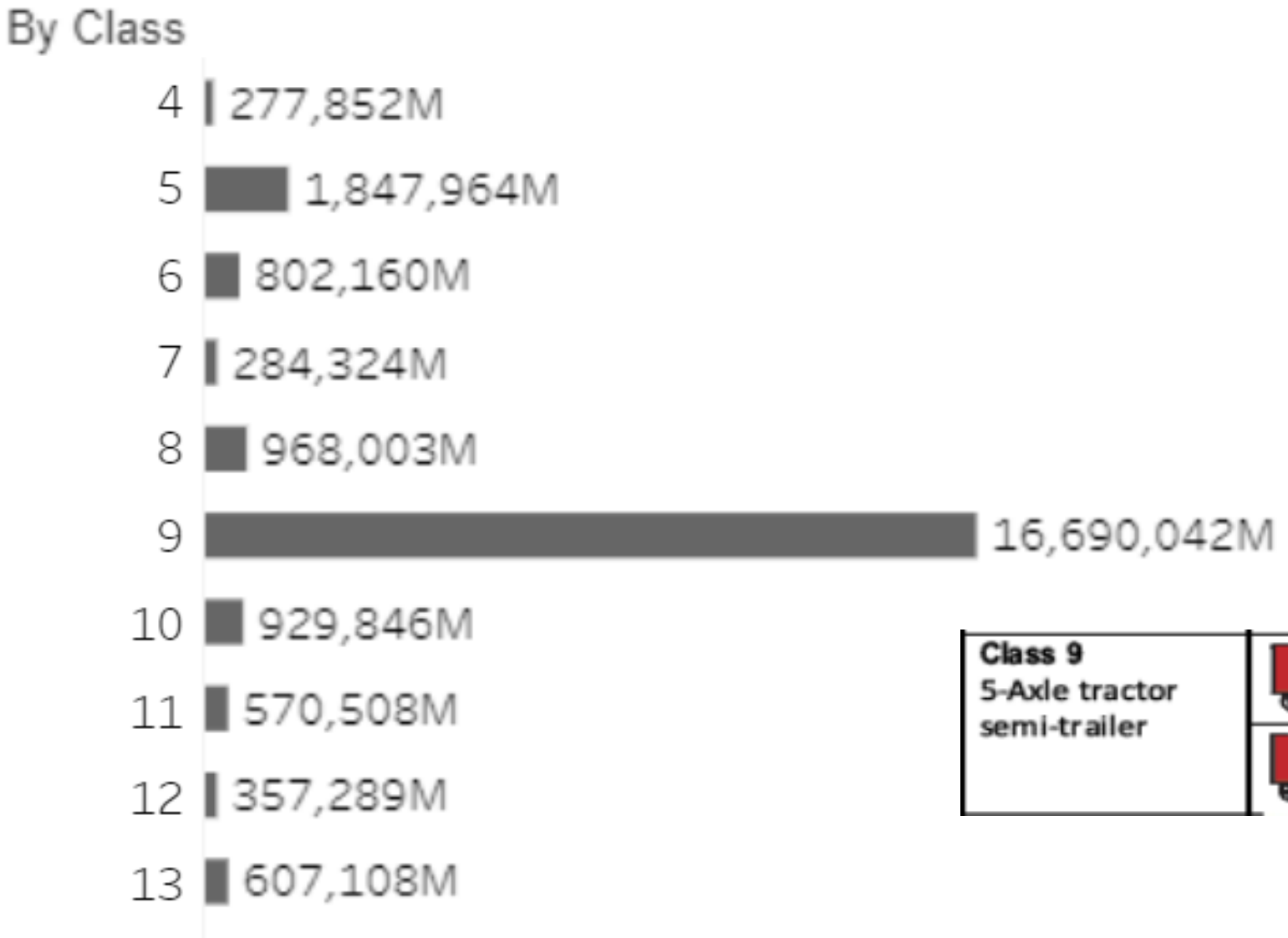
Source – FHWA TMAS 2021 WIM Dashboard

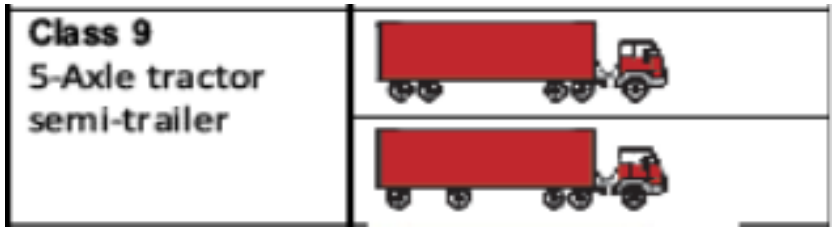
Distribution of Trucks by Day of the Week by Weight



Source – FHWA TMAS 2021 WIM Dashboard

Distribution of Vehicles by Truck Type by Weight





Source – FHWA TMAS 2021 WIM Dashboard

New Advances in WIM at FHWA

- Move to non-temperature dependent WIM sensors
- Re-identification of vehicles using various technologies
- Use of enforcement data (weigh station) for non-enforcement activities
- FHWA 2022 TMG IVR format contains a 5-digit vehicle signature field
  - Uniquely allows for very detailed classification of vehicles with a current inventory of 2,000 signatures with vehicle 5-digit codes
  - Vehicles signatures (loop, magnetometer, or video) allow for re-identification of all types of vehicles which then provides:
    - Travel time between sites
    - Travel time reliability between sites
    - Origin and Destination (O&D) for travel patterns
    - **Transfer of detailed WIM data** to other volume, speed and class sites
  - FHWA Pooled Fund TPF-5(520) will provide IVR data for a full year from 6 major corridors across the US

2022 TMG link: [Traffic Monitoring Guide - Policy | Federal Highway Administration]

WIM Research in the US

- **National Cooperative Highway Research Program (NCHRP) 20-50(20) project** titled "LTPP Data Analysis: Develop Practical Tools and Procedures to Improve WIM Data Quality" developed six practical tools and guidance for collecting high-quality WIM data.
- **New York City** using WIM for Direct Enforcement
- **Minnesota DOT** research on WIM sensor spacing and sensor arrays which includes tire position sensors
- **Bridge WIM** devices
- **Portable WIM** – we need good ways to measure weights for only a week or two to know site specific WIM data for local uses
  - Non-intrusive WIM
  - Bridge deflection methods
  - In-road sensors (road surface or imbedded)

Questions and Responses

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- FHWA WIM Pocket Guide with installation “how to” videos and helpful documents on best practices for a successful WIM program:
- Weigh-in-Motion Pocket Guide - Policy | Federal Highway Administration