Transportation Pooled Fund Program

To create Web-based Traffic Data Visualization and Analysis Tools

DRAFT Task 4 Report

Prepared for the Federal Highway Administration

By

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INTRODUCTION

The Task 4 Report of the FHWA Transportation Pooled Fund Program, *To create Web-based Traffic Data Visualization and Analysis Tool*, is structured to solicit feedback on the web based tools being developed at AVAIL. This report includes a complete list of proposed tools and visualizations as well as images with links of those that are in the beta testing phase.

2 SCOPE OF PROJECT

This section details the original scope of work of the Pooled Fund Study. The scope has changed slightly over the project lifetime. As discussed at the TA Panel Kickoff Meeting in Chicago as well as on various calls, AVAIL does not plan to include, in the web-tool, automatic export of AASHTOWare ME formatted data. AVAIL does plan to address pavement design concerns through highly customizable load spectra visualizations. Nor does AVAIL currently plan to include speed rating information using the Traffic Monitoring Guide format for speed bins.

The scope of work, below, is the official scope. The text reflects the TA Panel requested modifications/deletions highlighted in yellow.

2.1 OBJECTIVE

The objective of this work is to develop a web-based user friendly vehicle volume, classification, weigh-in-motion (WIM), and speed traffic data visualization analysis tool; where it accommodates traffic data in the Traffic Monitoring Guide (TMG) data formats, Highway Performance Monitoring System (HPMS) traffic data attributes, and Mechanical-Empirical Pavement Design Guide (AASHTOWare ME) global traffic data loading formats. The resulting product will offer: (1) data quality review and control functions; (2) GIS data visualization capabilities and analysis and (3) GIS data output controls to meet pavement design, freight analysis, and truck weight and load trend analysis, bridge load trend analysis and related truck travel data analysis.

The work involves investigating proven technologies and systems, e.g. “Travel Monitoring Analysis System (TMAS), Vehicle Travel Information System (VTRIS) Environmental Systems Research Institute (ESRI) Mapping, HPMS, Google map, SAS” to design and develop specific requirements that will process and generate quantitative analytical reports using easily assessable visualization output tools.

State Departments of Transportation (DOT), local agencies, universities and private industry may voluntarily contribute advice related to this research as non-paid participants. Periodic reviews will be arranged to keep participating States and agencies up-to-date on current developments.

2.2 SCOPE

It is essential to have an effective data visualization analysis tool that will assure quality traffic data for transportation program and project development. To meet freight transportation needs, infrastructure (pavement and bridge) preservation needs, and weight enforcement needs, an integrated traffic data analysis tool with both data quality control functions and data visualization capabilities is to be designed for ease of use by all agencies. Fundamentally, the designed tool is to be a user friendly web-based application handling truck

WIM and other traffic characterization data to generate quality data summaries that meet pavement design input, freight analysis, truck weight load trend analysis, bridge load trend analysis and other needs.

2.3 Task 4 -- Develop System Requirements

The contractor shall design a system that shall incorporate the following:

- Accommodation of various data formats including but not limited to linear referenced data (LRS) TMG weight, class, volume, and speed, AASHTOWare ME standard traffic input tables, bridge, weather and speed probe.
- Data validation process using various quality control techniques including but not limited to TMAS, Long-Term Pavement Performance, and VTRIS.
- Diverse data queries for specific analysis including but not limited to w-tables, truck weight roadway groups and load spectra.
- Export function for data in formats including but not limited to standard software; (i.e. Microsoft Excel, DBF, CSV, TMG, GIS / SHP, LRS, ESRI, Google).
- Data analysis process using proven statistical methods including but not limited to cluster analysis,
- Data linking capability for all roadway attributes and bridges of national significance and capability to associate corresponding data with HPMS LRS, TMAS, VTRIS W-Tables, National Highway System, National Highway Planning Network , land use, weather and current related developmental impacts.
- Graphical display features for all traffic and related attributes using standard universal GIS mapping formats and specifications. (e.g. shapefile or geodatabase for ArcMap) with the appropriate data, data categories, symbology, line weights, colors, etc. to produce a specific graphical representation.
- Recognition of legacy data output for upload into the study product, with option to export results into existing systems.

2.3.1 Deliverables

The contractor shall deliver a functional requirement document that defines all functions of the proposed system and its components.

2.4 Task 5 -- Establish Web-Based User Friendly Data Visualization Tool to Generate Appropriate Reports and Outputs

The contractor shall develop tools that display / report:

- Highway specific estimates of truck volumes and loadings by time of day, day of week, week of year and year to year.
- Monthly truck class adjustment factors.
- Heavy vehicle travel monthly trends.
- Axle loading trends.
- Highway ton-miles of freight moved each month.
- Flow maps linking all roadways seamlessly locally, regionally and nationally.
- Truck weight road groups locally, regionally and nationally.
- Load spectra by standard truck class and axle group type.
  AASHTOWare ME (MEPDG) inputs for project specific design requirements. Develop a process to synthesize raw data from existing traffic data collecting stations to match traffic stream parameters (e.g. average annual daily truck traffic, vehicle truck class distribution, monthly truck class adjustment

factors) particular to the project location.
- Loading trends for bridge stress.
- Speed trends.
- Size & Weight and Enforcement

2.4.1 Deliverables

The contractor shall provide a copy of the finished executable software program to the FHWA PC and all participating TA State members of this pooled fund study.

The contractor shall deliver to the FHWA PC and all TA State members contributing funds and participating in this pooled fund study a functional requirement document with methods in which traffic data attributes are processed including all specifications, source codes, etc. related to the all tasks.

The contractor shall validate and verify the system is performing all functions correctly described in the tasks.

The contractor shall provide to the FHWA PC and all TA member States contributing funds and participating in this pooled fund study a copy of all related documented processes and related programming associated with the work.

The contractor shall be available to assist the FHWA PC and all TA member States contributing funds and participating in this pooled fund study with the initial installation if needed.

The contractor shall maintain the system and provide technical assistance to the FHWA PC and all TA member States contributing funds and participating in this pooled fund study for a period of 1 year after the period of performance ends.

2.5 PERIOD OF PERFORMANCE

The period of performance for this Transportation Pooled Fund Program (TPFP) contract shall be 18 months. The contactor is to carryout active development for a period of no less than 12 months. The contractor shall maintain the developed system, provide technical assistance to the FHWA's PC and all TA members contributing funds and participating in the study for a period of no less than 1 year after the period of performance ends.

2.6 PROJECT TIMELINES

Table 1 Deliverable Timeline Chart form Scope of Work

TASK NUMBER	DELIVERABLES	DUE DATES (CALENDAR DAYS)
Task 1	Kick-Off Meeting with PC Monthly progress reports, quarterly TA meetings	Within 7 Days of Contract Award Throughout the Contract Period
Task 2	Coordinate TA in-person kick-off forum Draft forum summary report Final forum report	Within 20 Days After PC Kick-Off Meeting Within 10 Days After TA Forum Within 5 days after PC approve summary
Task 3	Identify Pros and Cons of various related technology Deliver optimal recommendations Final approved business design document	Within 3 months After Completion of Task2 Within 4months After Completion of Task2 Within 5months After Completion of Task2
Task 4	Develop System Requirements Document all processes and requirements	Within 12 months after contract award Within 13 months after contract award
Task 5	Establishing An On-Line User Friendly Data Tool To Generate Appropriate Reports and Outputs Test and evaluation fix bugs verification of Technical support	Within 16 months after Contract Award Within 18 months after Contract Award For 12 months after of Contract end

Table 2 Project Timeline in Gantt Chart Format

Task Number	Task Description	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15
1	Kickoff Meeting																		
2	TA Panel Forum																		
3	Optimal Recommendations																		
4	System Requirements																		
5-A	Establish Online Data Tool																		
5-B	Test Tool																		

Scope Tasks and Levels of Completeness		
Key	Planned Capability that is not yet started	
	Some level of Completeness	
	Complete or Mostly Complete	
	AVAIL does not plan to build	
Task	**Scope Item**	**Web-tool Capability**
4	Accommodation of various data formats including LRS TMG weight, class and volume	Many of the visualization tools use the various data formats
4	Data validation process using various quality control techniques including but not limited to TMAS, Long-Term Pavement Performance, and VTRIS.	AVAIL's only data quality tool address data upload duplication
4	Diverse data queries for specific analysis including but not limited to w-tables, truck weight roadway groups and load spectra.	Many of the visualization tools use the various data formats
4	Export function for data in formats including but not limited to standard software; (i.e. Microsoft Excel, DBF, CSV, TMG, GIS / SHP, LRS, ESRI, Google).	AVAIL has not yet built download to CSV, SHP, and SVG capabilities into the site. This is a planned capability
4	Data analysis process using proven statistical methods including but not limited to cluster analysis,	Cluster Analysis is a planned capability. This is not yet finished
4	Data linking capability for all roadway attributes and bridges of national significance and capability to associate corresponding data with HPMS LRS, TMAS, VTRIS W-Tables, National Highway System, National Highway Planning Network , land use, weather and current related developmental impacts.	This is not a planned capability
4	Graphical display features for all traffic and related attributes using standard universal GIS mapping formats and specifications. (e.g. shapefile or geodatabase for ArcMap) with the appropriate data, data categories, symbology, line weights, colors, etc. to produce a specific graphical representation.	The maps being built by AVAIL include these map specifications.
4	Recognition of legacy data output for upload into the study product, with option to export results into existing systems.	Reports are being built by AVAIL based on reports being generated by State DOTs. Output will be in csv format and svg
5	Highway specific estimates of truck volumes and loadings by time of day, day of week, week of year and year to year.	Many of the visualization tools use the various data formats
5	Monthly truck class adjustment factors.	AVAIL currently has algorithms to calculate Seasonal Adjustment. We are currently deploying this in the Station Dashboard tab and in future tools
5	Heavy vehicle travel monthly trends.	Complete
5	Axle loading trends.	This is a planned capability
5	Highway ton-miles of freight moved each month.	This is a planned capability
5	Flow maps linking all roadways seamlessly locally, regionally and nationally.	Complete
5	Truck weight road groups locally, regionally and nationally.	Will be included in reports
5	Load spectra by standard truck class and axle group type.	AVAIL will not be building this
5	AASHTOWare ME (MEPDG) inputs for project specific design requirements. Develop a process to synthesize raw data from existing traffic data collecting stations to match traffic stream parameters (e.g. average annual daily truck traffic, vehicle truck class distribution, monthly truck class adjustment factors) particular to the project location.	AVAIL will not be building this
5	Loading trends for bridge stress.	This is a planned capability
5	Speed trends.	AVAIL will not be building this
5	Size & Weight and Enforcement	This has been started but not fully complete

3 TASK 4: PROCESSES AND REQUIREMENTS

- Scope of Work: The contractor shall deliver a functional requirement document that defines all functions of the proposed system and its components.

The Task 4 Report:

1. Presents an overview of various Client Modules (tools and visualizations) in development or proposed;
2. Creates a framework for discussion about optimal tools and visualizations;
3. Defines a final set of Client Modules;
4. Identifies all optimal tools and visualizations for development; and
5. Facilitates AVAIL's effort to build the most informed and cutting-edge tool.

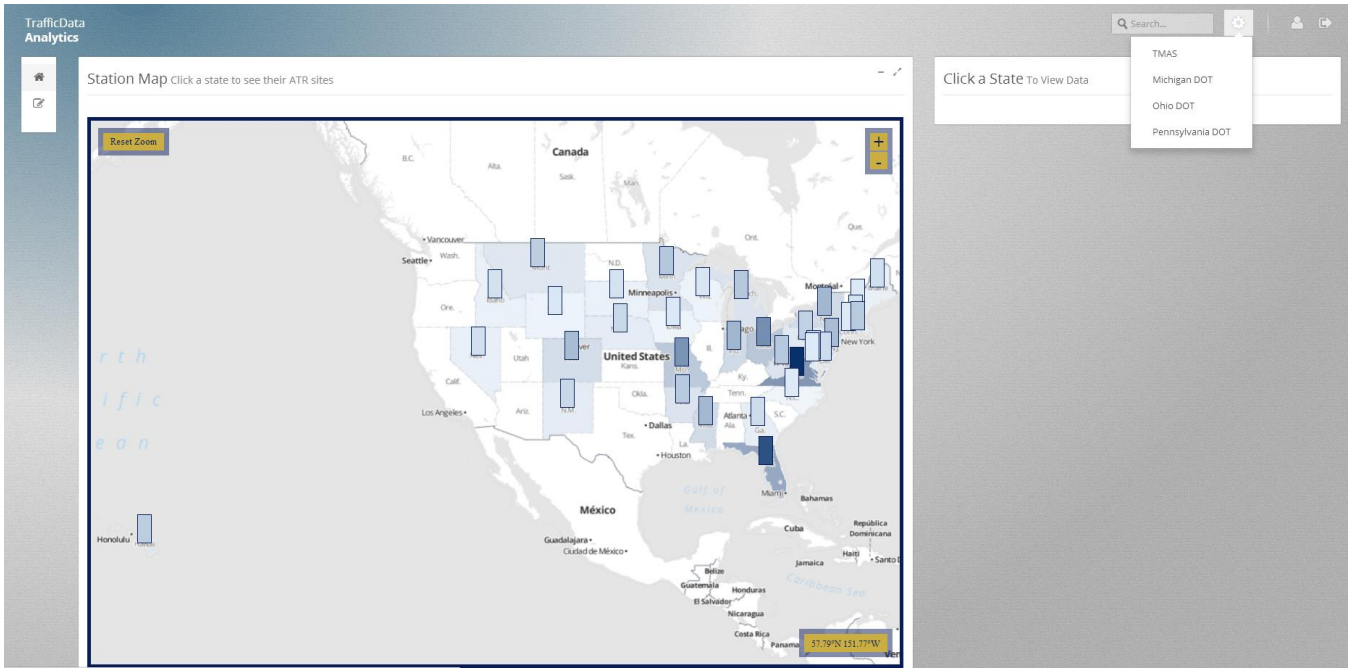


Figure 1 Web-Tool Landing Page

4 CLIENT MODULES

The Client Modules outlined in this report are in beta testing phase. The maps, visualizations, and web user interface designs are highly detailed approximations. All designs are open for discussion. Modules are currently at various stages of completeness. Some are in conceptualization mode, while others are fully programmed and web ready.

4.1 DASHBOARD

The Dashboard allows the user to select a state and get an overview of the traffic monitoring system in that state.

4.1.1 National Map

The National Map shows the current data set[1], zooms to show all states with data available. States are choropleth shaded based on number of stations producing data, with darker states having more stations. This is a "slippy" map, with zooming and sliding capabilities.

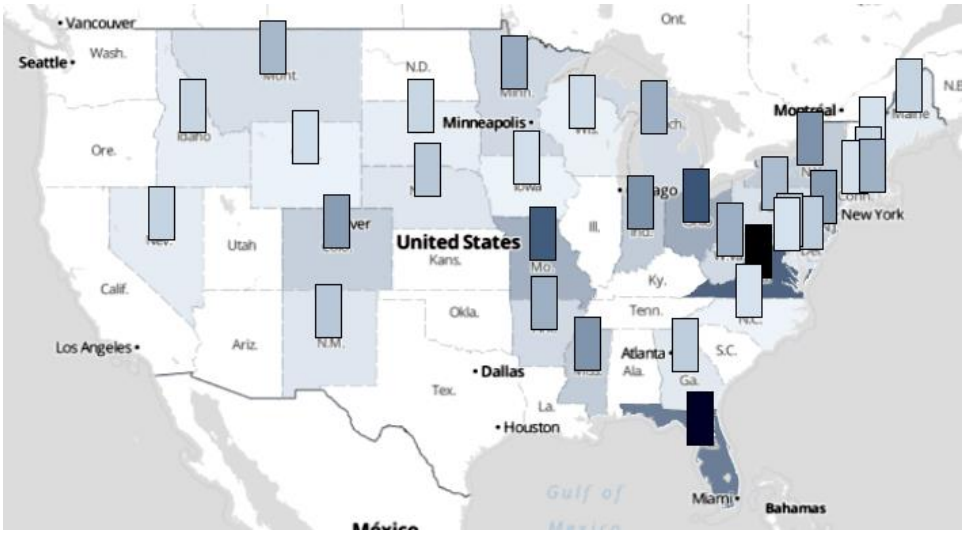


Figure 2 US Map of State Data Availability

Questions you can answer: How many of my neighboring states have data available? How does my state compare nationally in terms of number of stations providing data?

[1] Information about TMAS can be found in the Task 3 Report.

4.1.2 State Map

To view state-level data, users must click on the rectangle that corresponds with the state of interest. In this case, we clicked on Michigan.

The squares now represent types of stations in the state: Blue squares are WIM Stations and Orange squares are Class Stations.

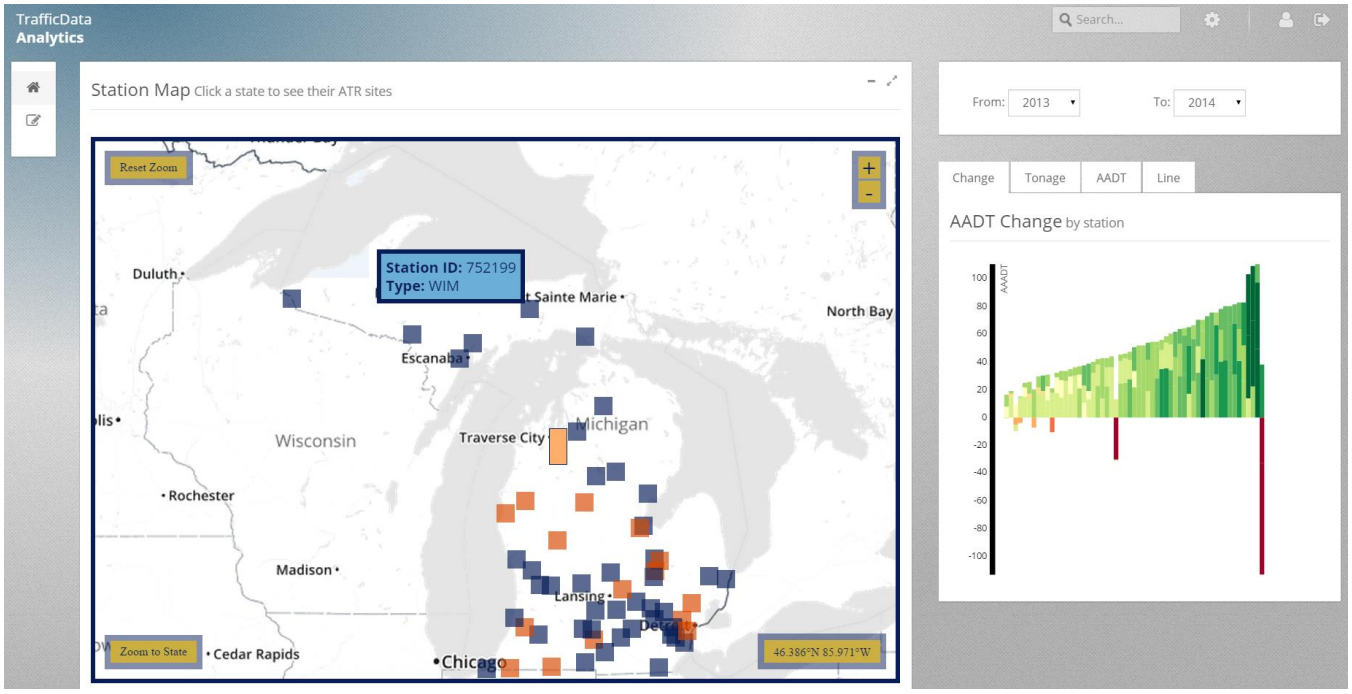


Figure 3 State Level Map Indicating Station Distribution and Type

Questions you can answer: What is the spatial distribution of WIM Stations compared to Class Stations? What types of stations are available near state borders?

4.1.3 AADT Overview Panel

The AADT Overview Panel has a map on the left-hand side and a set of data visualizations on the right. The map in the center shows WIM and Class stations across the state. As you scroll over the stations, the data to the right is highlighted, showing the bar that corresponds to each station. Likewise, when you scroll on the bars, the WIM or Class site square turn yellow, to show the station associated with the bar.

4.1.3.1 Bar Chart to show year over year change in AADT of all Stations

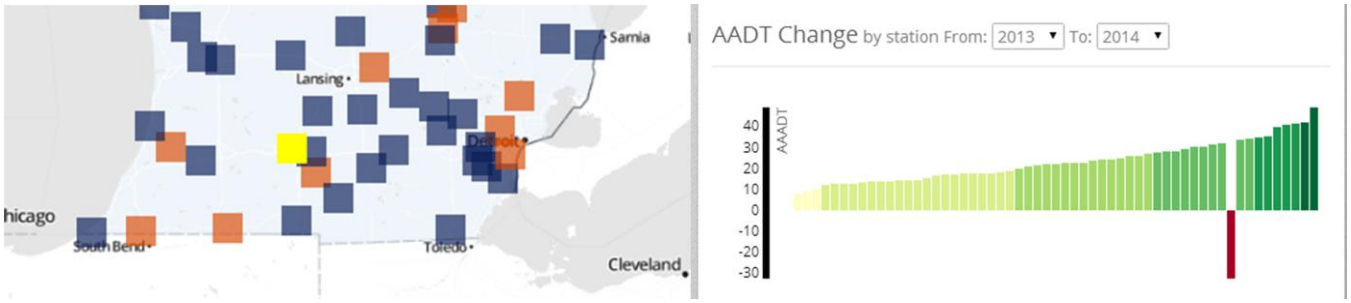


Figure 4 Illustration of Interactivity between State Map and Yearly Comparison Bar Chart for AADT for All Stations

Questions you can answer: Are traffic volumes in my state increasing or decreasing over the last year? Were these changes occurring in previous years?

4.1.3.2 Bar Chart to show AADT of all stations (by Avg of All years, or individual year) (by Vehicle Class)

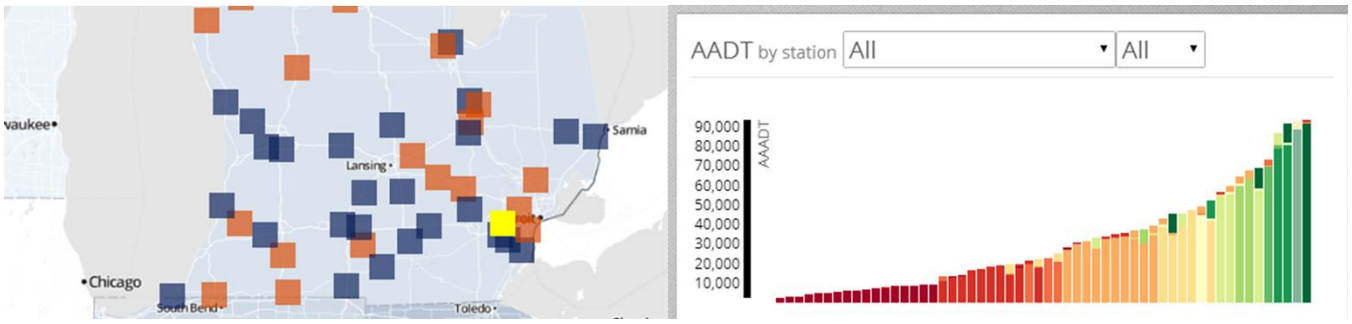


Figure 5 Illustration of Interactivity between State Map and AADT Traffic Volume by Station

Questions you can answer: Which stations in my state are experiencing the heaviest volumes on average for all years of data available? Which stations in my state are experiencing the heaviest volumes on average last year?

4.1.3.3 Line Chart to show MADT (average, by year) (by Class)

The line chart shows volume of traffic by class by month and can be filtered by station.

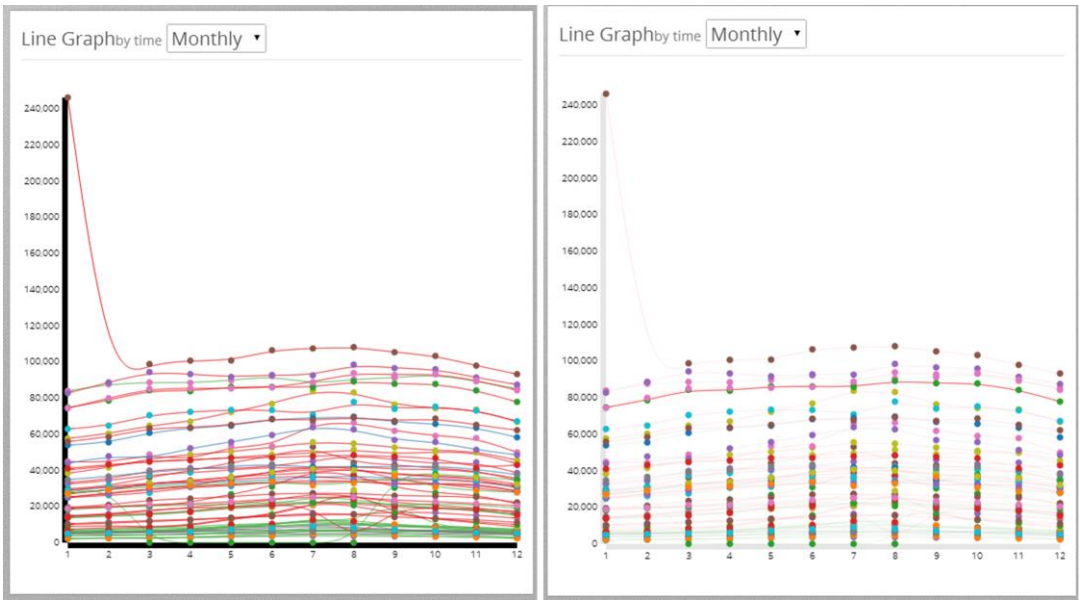


Figure 6 Illustration of Line Chart Showing Monthly Traffic Volume of All Stations or a Single Station

Questions you can answer: What are the monthly volume trends at all stations across my state? What are the seasonal volume variations for any one single station in my state?

4.1.3.4 Line Graph to show Average Daily Traffic Distribution

This Graph is based on a twenty-four hour period and shows traffic trends by class and station.

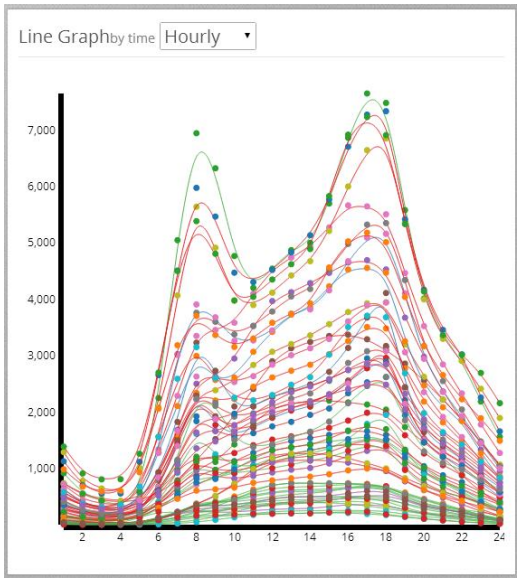


Figure 7 Line Graph Showing Distribution of Traffic by Time of Day for All Stations

Questions you can answer: What are the hourly volume trends at all stations across my state? What are the peaking characteristics of any one single station in my state?

4.1.4 Interconnected Visualizations

Each of the bar graphs and line graphs interact with the map. As you can see in Figure 8, the yellow square shows the geographic location of the station that corresponds with selected line in the line graph at right. The line graph shows volume by month for that station.

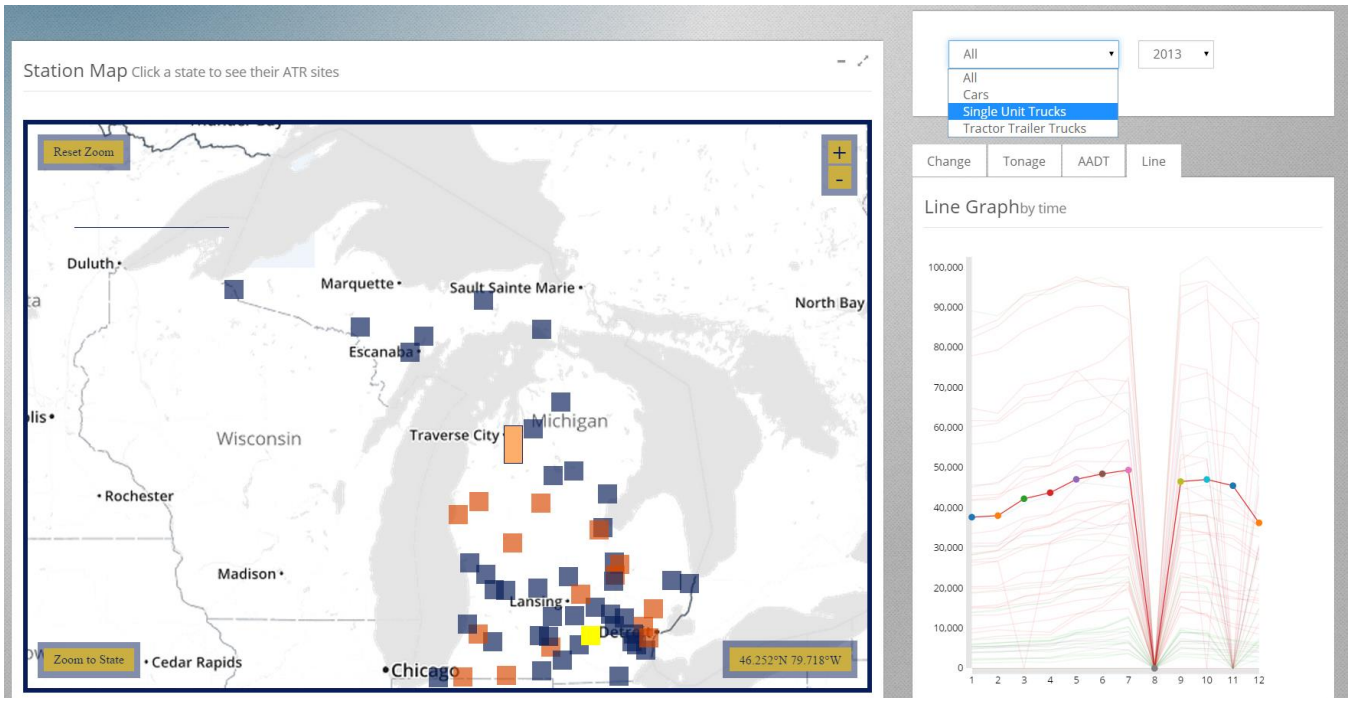


Figure 8 Screen Shot of Web-Tool, Illustrating Interactivity of Multiple Graphics

Questions you can answer: At the station closest to Detroit, what month had the highest volume of a vehicle type (Car, Single Unit Truck, or Tractor Trailer)? Was this pattern the same at my other sites?

4.2 SINGLE STATION OVERVIEW

By clicking on the box that corresponds with a given station, you can access information specific to that station. The Single Station Overview page displays a comprehensive overview of raw data available for single station.

Figure 9 Screenshot of Single Station Overview

4.2.1 Single Station Tabs

On each station page, the graphs, reports and station info are now organized by tab. The image below shows the tabs for a typical WIM station.

Figure 10 WIM Station Tabs

4.2.2 Truck Volume Tab

4.2.2.1 Volume by Time Graph (filterable by weight & class and time (year,month,day)

The Single Station Overview is a dynamic data visualization page. The right-hand side of the page (Figure 3) shows basic information about the site, (e.g., the number of lanes, the WIM method, the WIM Calibration, etc.). The graph in the center of the page is interactive. The X-Axis shows the year, the Y axis volume of traffic. Class types are broken out by color in each bar, and respond when you mouse-over the bar by turning red, showcasing the exact data. In Figure 10, you can see the mouse-over information for class 5 vehicles at station 829209, in the year 2009.

By clicking on the bar for the year 2009, you can access the month by month view (Figure 3) displaying traffic volume by class for this station.

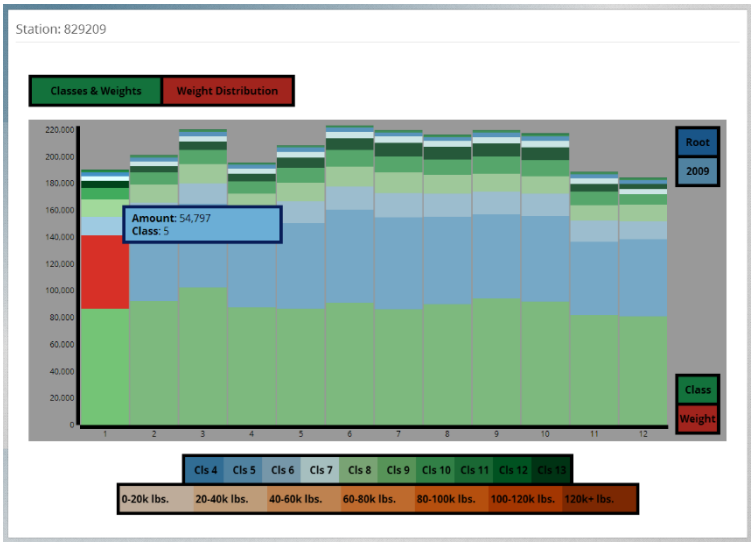


Figure 11 Monthly Graph of Traffic Volume by Class

Questions you can answer: In March, how many Class 9 vehicles were counted at this station? Has the number of Class 9 vehicles been increasing or decreasing over the year?

4.2.2.2 Weight by Time Graph (filterable by weight & class and time (year, month, day)

Similar to the Volume by Time Graph is the Weight by Time Graph. You access this graph by clicking on the red box labeled Weight, in the bottom right of this pane (toggle for class or weight.) This Weight by Time Graph behaves exactly the same way as the Volume by Time Graph, with mouse-overs and drill-downs into monthly information by clicking on the desired year.

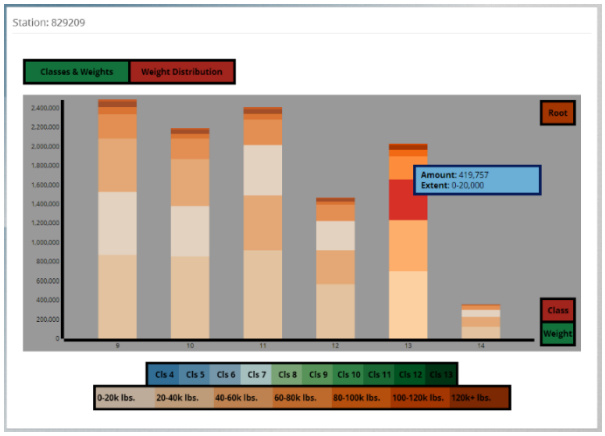


Figure 12 Yearly graph of traffic volume by weight

Questions you can answer: Which year had the highest percentage of overweight (> 80,000 lbs.) vehicles at this station? For how many years did this pattern of overweight vehicles persist?

Another functionality of these Volume by Time and Weight by Time Graphs is the ability to turn vehicle and weight classes on and off by clicking on the horizontal color bars below the graph. You'll notice in Figure 12 that classes 4-9 and 11-13 have been turned off. The bar graph in Figure 12 now shows only the traffic volumes of class 10 by weight and year.

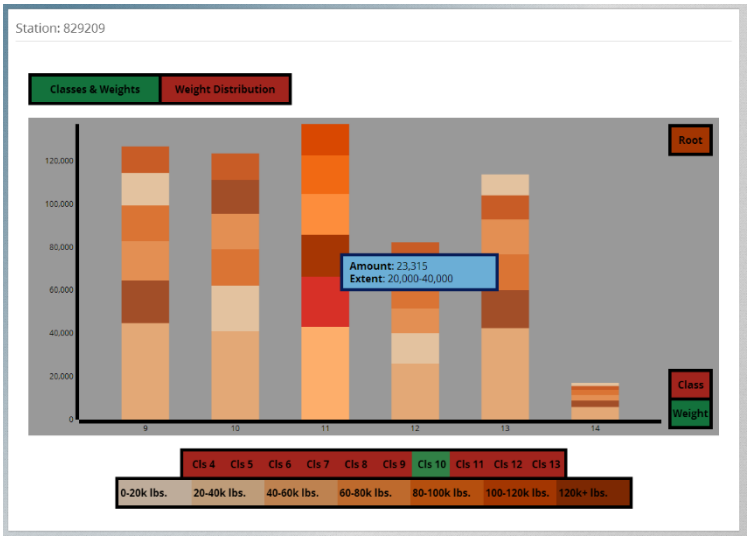


Figure 13 Yearly Graph of Traffic Volume by Weight of Class 9 Vehicles

Questions you can answer: Looking only at Class 9 vehicles, which year had the highest number of 80,000 lbs + vehicles? What trends can be detected over the years or months of available data?

4.2.2.3 Weight Distribution Graph

The Weight Distribution Graph is filterable by weight & class by time (year, month, day) by total weight and by tandem axle weight. It is colored in quartiles with lightest color indicating the empty or near-empty hauls. The darker colors indicating heavier trucks. Overweight is indicated by the darkest color on the right-hand side of the graph.

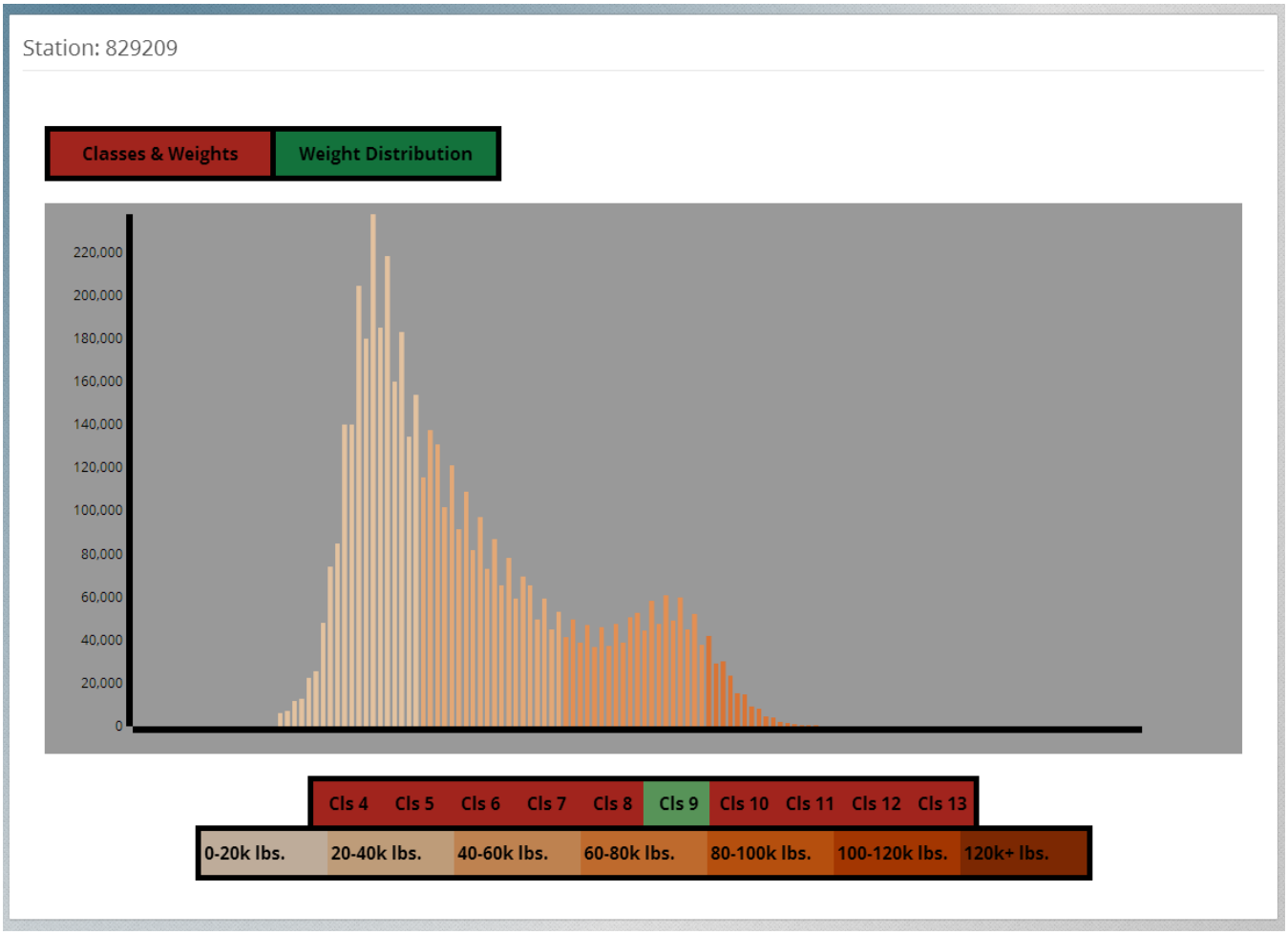


Figure 14 Distribution of Weight by Class at a Single Station

Questions you can answer: For Class 9 vehicles, what were the hauling patterns with respect to empties (<20,000 lbs) at this station over the year? What is the distribution of overweight vehicles at this site?

4.2.3 Seasonality Tab

The Seasonality tab is set up to give you large volume data over time in various visualizations. The purpose of the seasonality section is to give the user an idea of how a station behaves over the course of a year.

4.2.3.1 Yearly Volume Graphs

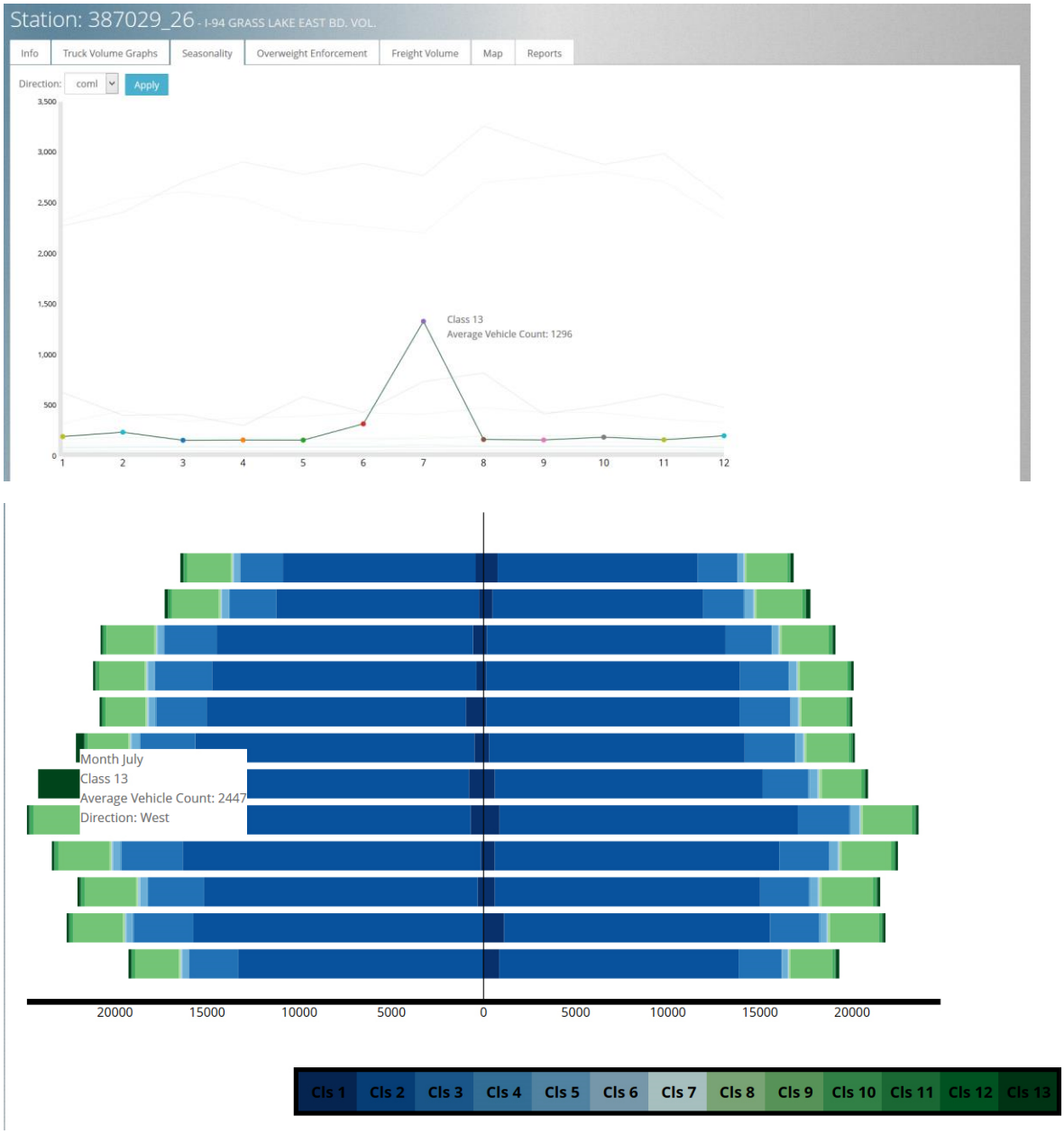


Figure 15 Single Station Page, Yearly Volume Graphs

Questions you can answer: How does overall traffic volume change through the seasons? How does traffic volume for each class change seasonally by direction?

4.2.3.2 Calendar View - shows Daily Traffic Totals (by class)

The Calendar Visualization is a heat map that shows volume of traffic by day, week, month and year. Peak volume is dark green. This calendar also reveals gaps in data and highlights trends across calendar years. The distribution of red clearly indicates weekend behaviors.

This graph is a visualization of yearly highest days.

Figure 16 Calendar Heat Map Illustrating Distribution of Traffic by Class or All

Questions you can answer: How many days was this station not reporting data? What were the heaviest traffic totals by day of the week and month at this station?

4.2.4 Calibration Chart - show front axle weight / Axle A spacing

The purpose of the Calibration Chart is to determine the quality of the data. The chart in figure 15 is an example illustration showing the ability to determine how much of the data falls within acceptable boundaries.

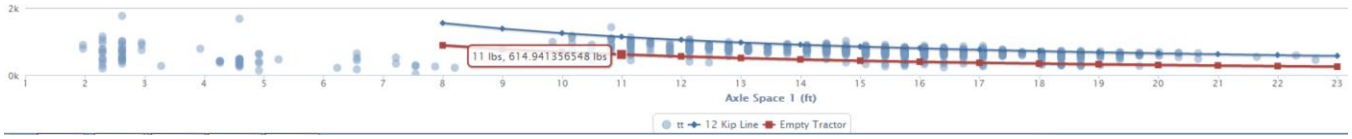


Figure 17 Example of Calibration Illustration

Question you can answer: What is the quality of the data from this station?

4.2.5 Single Station Enforcement

Show visualizations relevant to overweight enforcement at a single site.

4.2.5.1 Deployment Grid

This grid shows the number and percent of overweight trucks (total weight or tandem axle) by day or week and time of day (filter by year, month).

Figure 18 Example of Enforcement Deployment Tool

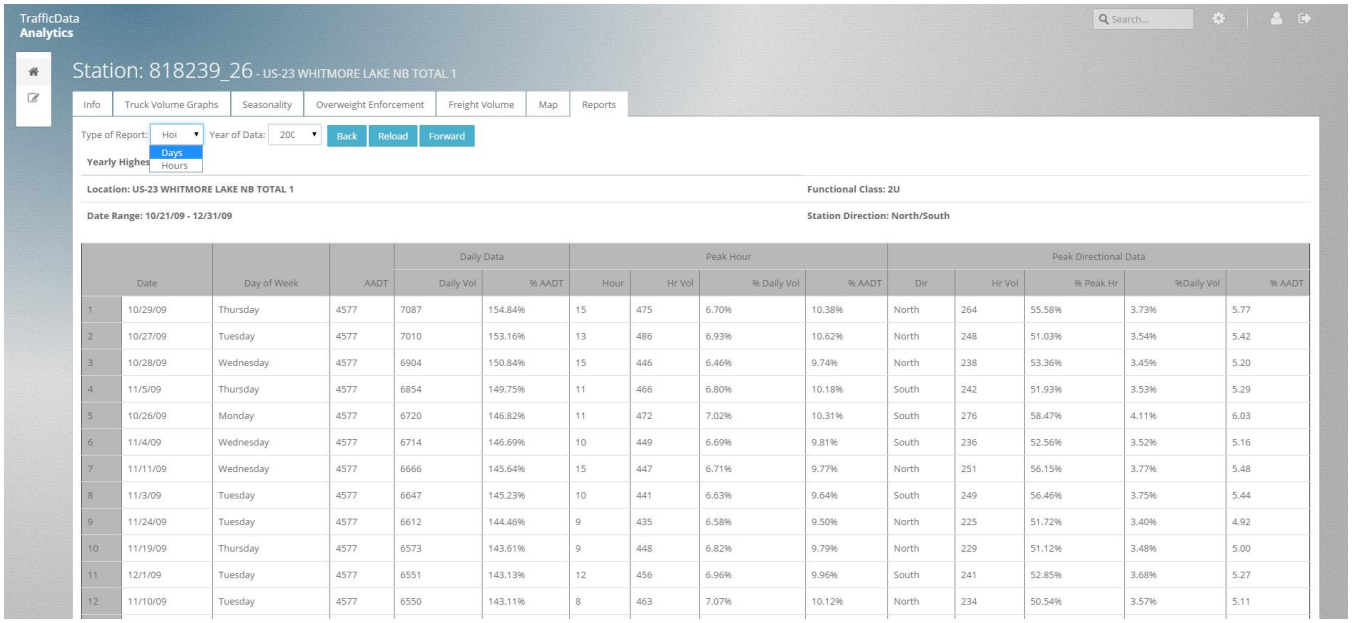
Questions you can answer: What time of day and day of week are the highest percentages of overweight trucks at this station? Which direction are those overweight trucks traveling?

4.2.5.2 Calendar View

This Calendar is similar to the Calendar View of Daily Traffic Totals as seen in Figure 14 except this calendar shows variation in overweight trucks by day, week and month. This tab will soon allow the user to set the overweight limit for each vehicle class.

4.2.6 Reports

AVAIL is developing a reports section for the web-tool. The report below is based on two reports submitted by Ohio DOT: Yearly Highest Days and Yearly Highest Hours.



	Date	Day of Week	AADT	Daily Data		Peak Hour				Peak Directional Data				
				Daily Vol	% AADT	Hour	Hr Vol	% Daily Vol	% AADT	Dir	Hr Vol	% Peak Hr	%Daily Vol	% AADT
1	10/29/09	Thursday	4577	7087	154.84%	15	475	6.70%	10.38%	North	264	55.58%	3.73%	5.77
2	10/27/09	Tuesday	4577	7010	153.16%	13	486	6.93%	10.62%	North	248	51.03%	3.54%	5.42
3	10/28/09	Wednesday	4577	6904	150.84%	15	446	6.46%	9.74%	North	238	53.36%	3.45%	5.20
4	11/5/09	Thursday	4577	6854	149.75%	11	466	6.80%	10.18%	South	242	51.93%	3.53%	5.29
5	10/26/09	Monday	4577	6720	146.82%	11	472	7.02%	10.31%	South	276	58.47%	4.11%	6.03
6	11/4/09	Wednesday	4577	6714	146.69%	10	449	6.69%	9.81%	South	236	52.56%	3.52%	5.16
7	11/11/09	Wednesday	4577	6666	145.64%	15	447	6.71%	9.77%	North	251	56.15%	3.77%	5.48
8	11/3/09	Tuesday	4577	6647	145.23%	10	441	6.63%	9.64%	South	249	56.46%	3.75%	5.44
9	11/24/09	Tuesday	4577	6612	144.46%	9	435	6.58%	9.50%	North	225	51.72%	3.40%	4.92
10	11/19/09	Thursday	4577	6573	143.61%	9	448	6.82%	9.79%	North	229	51.12%	3.48%	5.00
11	12/1/09	Tuesday	4577	6551	143.13%	12	456	6.96%	9.96%	South	241	52.85%	3.68%	5.27
12	11/10/09	Tuesday	4577	6550	143.11%	8	463	7.07%	10.12%	North	234	50.54%	3.57%	5.11

Figure 19 Yearly Highest Days Report

The report ranks the highest days for a single station for total volume and displays that volume as a percent of AADT. A report like this could also be generated as a comparative report between stations.

Location: US-23 WHITMORE LAKE NB TOTAL 1

Date Range: 10/21/09 - 12/31/09

	Date	Day of Week	AADT	Daily Data		Peak Hour		
				Daily Vol	% AADT	Hour	Hr Vol	% Daily Vol
1	10/29/09	Thursday	4577	7087	154.84%	15	475	6.70%
2	10/27/09	Tuesday	4577	7010	153.16%	13	486	6.93%

4.3 ROAD NETWORK ANALYSIS

The Road Network Analysis section of the Web-Tool visualizes the road network based on HPMS[2], short counts and a number of derived sources.

4.3.1 HPMS Road Network Map

To access the HPMS Road Network Map click on the dropdown menu on the top left side of the map.

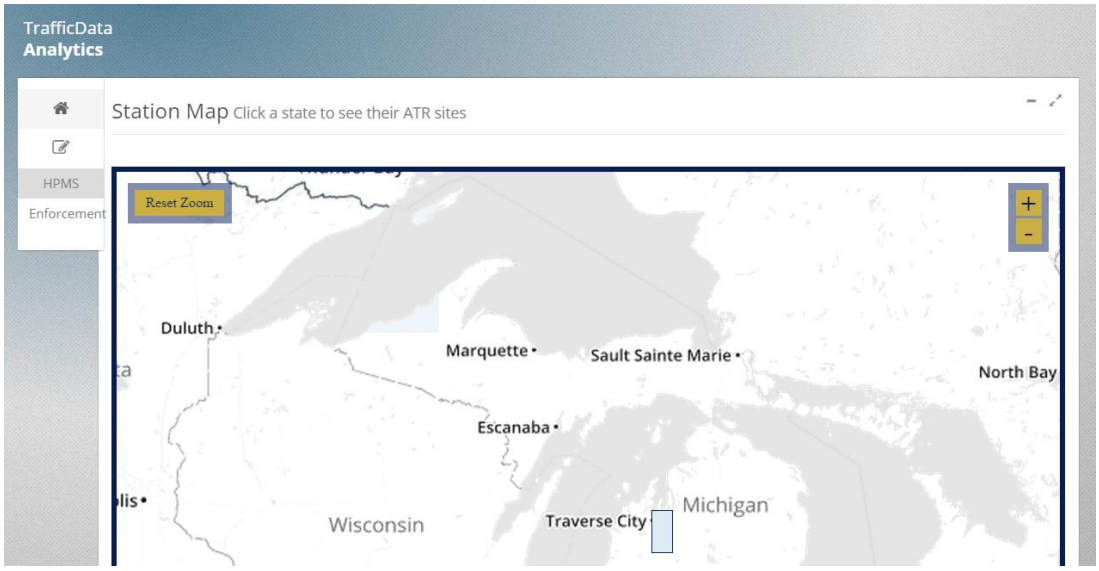


Figure 20 Dashboard, Illustrating HPMS Dropdown Menu at Left

The HPMS Map has a menu on the top left corner of the map that allows a user to choose a state, set of states, or interstate roadways.

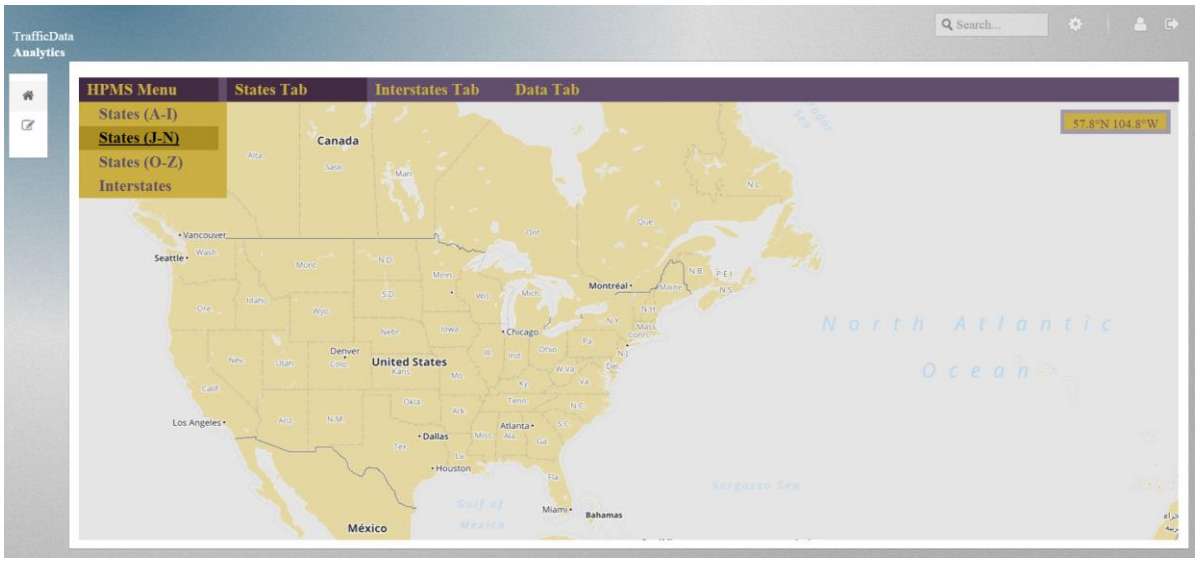


Figure 21 HPMS Map, Illustrating HMPS Menu at Left

[2] Information about HPMS can be found in the Task 3 Report.

After the user chooses a state or interstate, the map will populate with count data. The user can hover over a roadway segment to display the data for that segment of road.

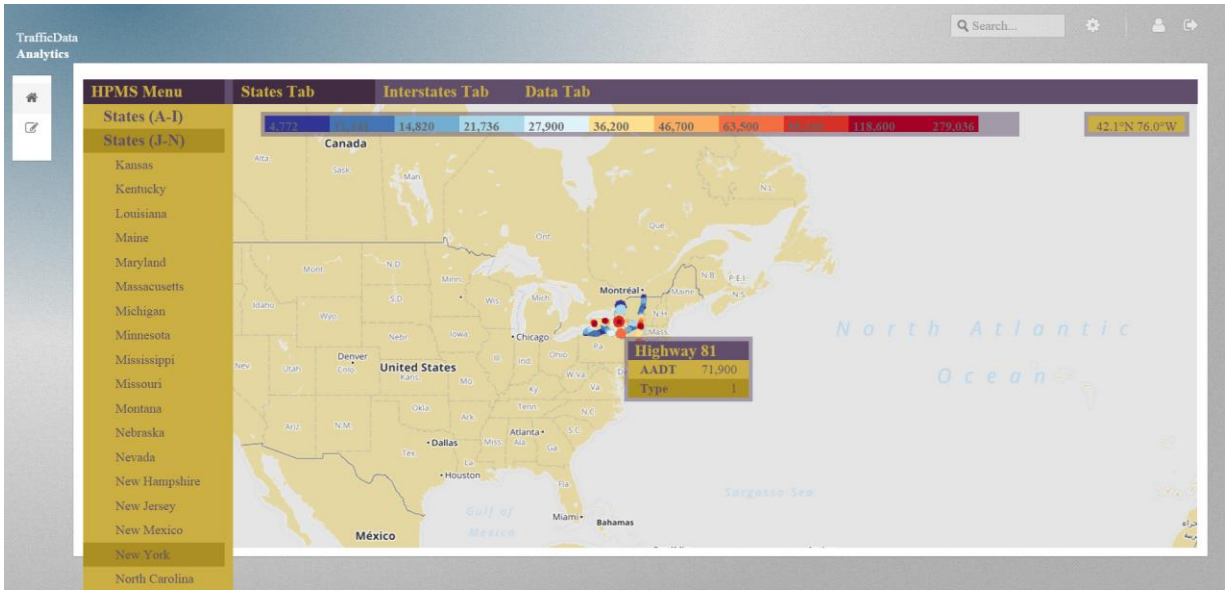


Figure 22 HPMS Map, Zoomed Out with New York State Selected

As the user zooms in to the map, next level road types appear on the map. First type 2, then type 3, and so on. Each segment of road displaying HPMS data has data specific to that segment.

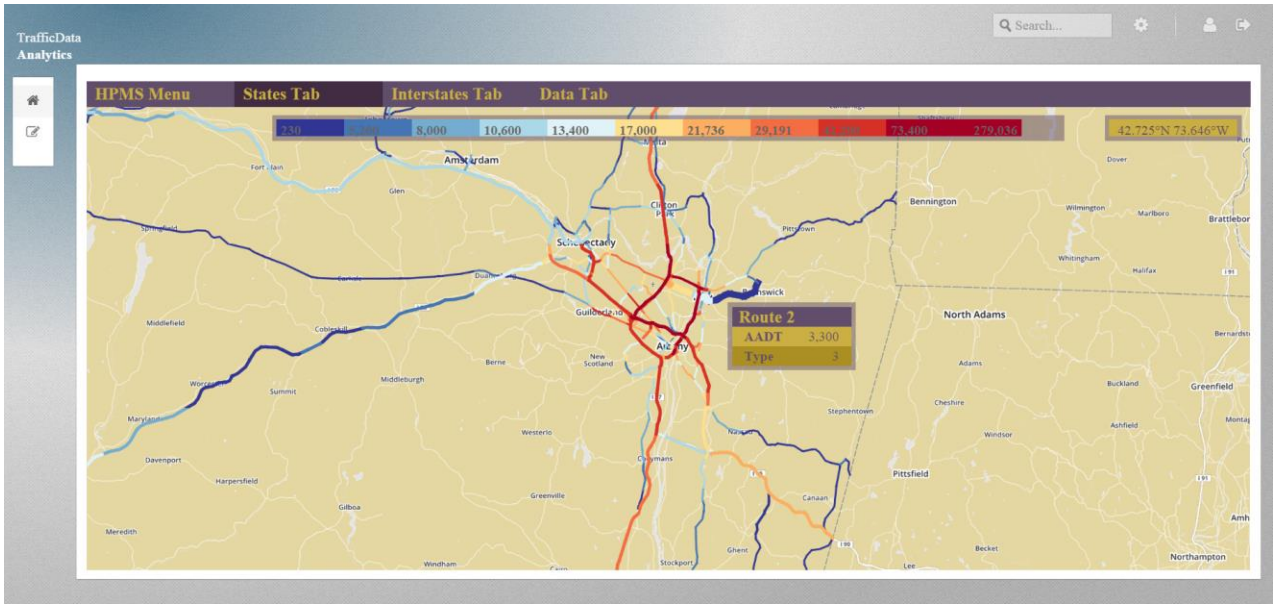


Figure 23 HPMS States Tab, Illustrating Zooming Feature of HPMS Map

Questions you can answer: Which road segments experience the highest volume? How does traffic volume disperse from one road segment to others?

AVAIL is developing this HPMS map to include road segments by HPMS AADT & Truck AADT (by Year), by calculated AADT & Truck AADT, Vehicle Tonnage & Payload Tonnage (by year, by month), by FAF Vehicle Tonnage (& other FAF variables) (by year).

4.3.2 HPMS Data Tab

The Data tab visualizes HPMS data into bar graphs by state by road segment type. These graphs will soon allow the user to dive deeper into state HPMS data by segment type as well as comparing selected road segments.

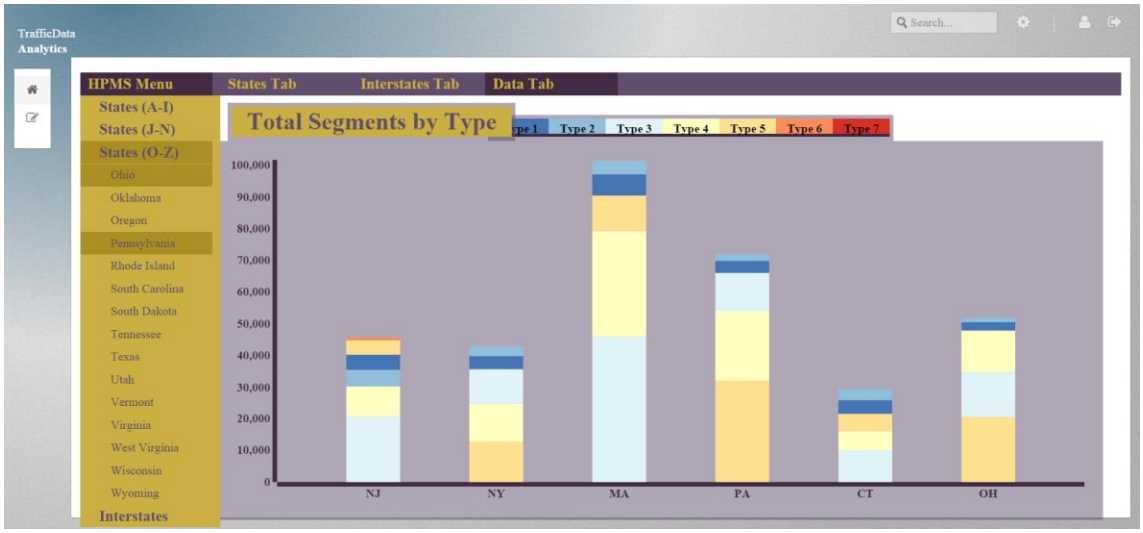


Figure 24 HPMS Data Tab Illustrating State HPMS Data by Road Segment Type

The graph is interactive. Each state bar segment you click on opens a data box on the right that shows the road type, the AADT, and the number of segments in the state.

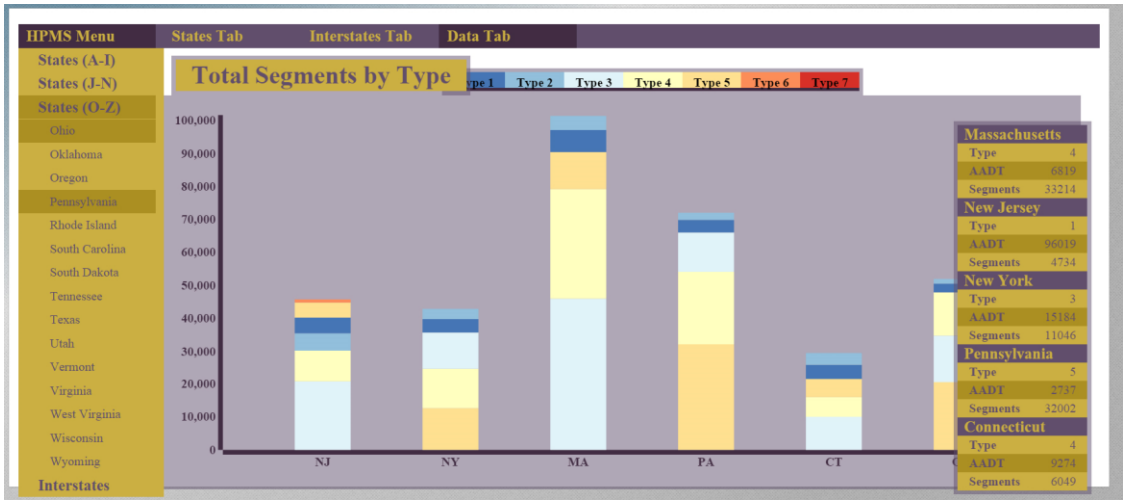


Figure 25 HPMS Data Tab Illustrating Data Box on Right

Questions you can answer: How is volume by road segment distributed in my state compared to other states? What road segment types are being used most often?

4.3.3 HPMS Interstates Tab

The first draft of this road segment map is illustrated by the figure below.

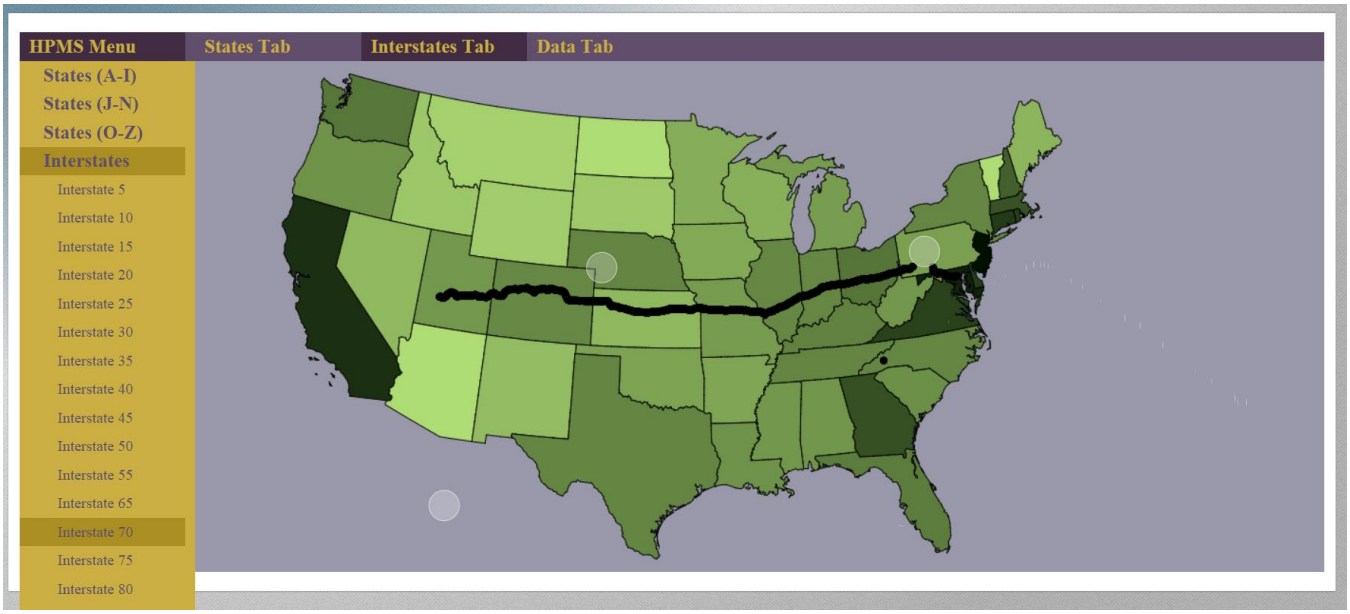


Figure 26 HPMS Interstate Tab

Questions you can answer: How much volume and weight is traveling on the interstate system between states?

4.4 Corridor Analysis

The concept for Corridor Analysis is still being fleshed out. It will combine HPMS and class and weight station information with customizable corridor linkages.

4.5 Enforcement Dashboard

The enforcement Dashboard is still being developed. The idea is to build a dashboard that provides an overview of statewide overweight trucks. All visualizations are filterable by month and year. The Enforcement Dashboard is a future features mock up. None of the Enforcement suite of tools are functional in the current Web-Tool.

4.5.1 Rank Stations by forecasted overweight percent and count

The ranking of stations by overweight behaviors will allow the user you to see which stations have the most heavy truck traffic by day of the week across the state. This can be used in planning deployment scheduling in

advance. This graph ranks each station by a customizable composite index based on historical data.

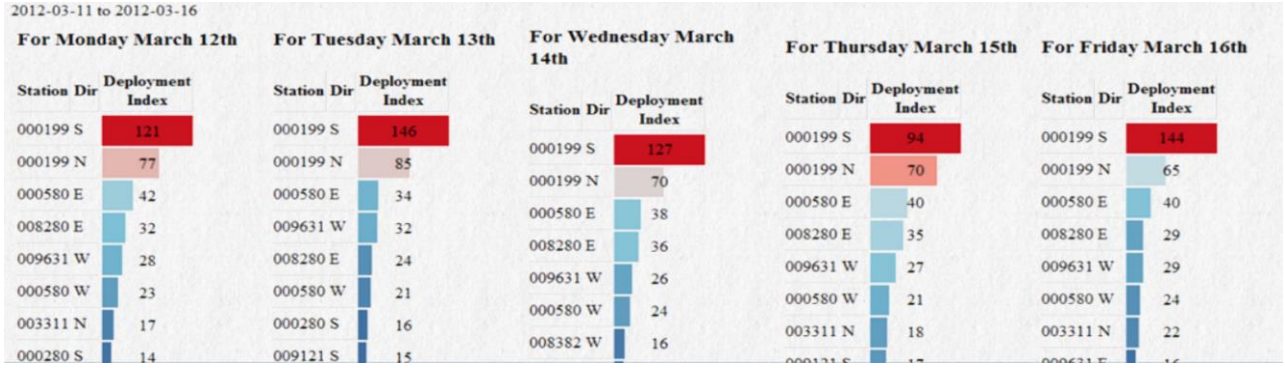


Figure 27 Example of station ranking tool

Questions you can answer: At which stations should overweight truck enforcement staff by deployed on Mondays? What day of the week is most important for enforcement at a given station?

4.5.2 Maps of corridors showing most likely overweight segments.

This map is currently under construction. It will be a composite of HPMS and weight records by highway corridor.

4.5.3 Map of stations visualized by overweight percent or count

This map is currently under construction. It will be similar to the State Overview Map (Figure 3) but with overweight percentages and counts shown in choropleth shading and customizable to state weight regulations.

4.6 Data Management

Tools for managing the website will be constructed at the end of the tool building phase. Below are a list of planned admin tools. Please suggest any desired tool functions.

4.6.1 Settings Page

4.6.1.1 Set visualizations color scheme

4.6.1.2 Overweight limit (total weight & axle weight)

4.6.1.3 Set bridge weight limits