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Evaluation of Truck Tonnage Estimation Methodologies

Prepared for:

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SI MODERN METRIC (CONVERSION FACTORS)

APPROXIMATE CONVERSIONS TO SI UNITS				
Symbol	**When You Know**	**Multiply By**	**To Find**	**Symbol**
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams ("metric ton")	Mg
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS				
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg	megagrams ("metric ton")	1.103	short tons (2000 lb)	T
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

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16. Abstract
Truck tonnage is an important mobility measure to evaluate transportation system performance, which can identify how much freight is moved. This study develops a methodology for truck tonnage estimation, which consists of three main parts: (i) Weigh in Motion (WIM) sites clustering, (ii) truck volume estimation based on Telemetric Traffic Monitoring sites (TTMS) data, and (iii) average truck tonnage calculation for WIM site. In this methodology, WIM sites were divided into different groups by applying the K-nearest neighbor algorithm, based on the truck tonnage distributions and average truck volumes. A clustering classification was then fitted to the TTMS, based on truck volumes and distances to the WIM sites. To avoid the double-counting issue, strategic TTMS were selected, considering the locations of the sites, the daily factor (commonly known as the D factor), and the truck factor (commonly known as the T factor). Afterwards, vehicle classes in WIM sites were categorized by a K-mean clustering method based on the vehicle loads for calculating the average truck tonnage. Furthermore, the empty vehicle weight for different vehicle classes was estimated, applying Gaussian distribution of gross tonnage. At last, a weighted mean method was applied to calculate the average truck tonnage. The aforementioned methodology was tested in a case study of truck tonnage estimation in Florida using WIM data in 2012 and 2017, and compared with the method using the 2012 data released by the Freight Analysis Framework (FAF). The proposed model might shed light on the statewide performance evaluation of freight mobility.

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EXECUTIVE SUMMARY

Truck tonnage is an important mobility metric to determine the quality of the transport system. For freight transport planning, traffic control, weight compliance, and transport infrastructure layout, the estimate of truck tonnage is needed. This paper establishes a truck tonnage estimation methodology consisting of three main components: Weight in Motion (WIM) clustering sites, truck volume estimate based on data from Telemetric Traffic Monitoring Sites (TTMS), and average truck tonnage measurement for WIM sites.

First, according to the truck tonnage distribution and average truck volume, WIM sites were divided into different groups based on the application of the K-nearest neighbor algorithm. Then, based on truck volume and distances to the WIM sites, a clustering classification was fitted to the TTMS. In order to avoid the double-counting issue, strategic TTMS was selected taking into account site locations, the D factor and the T factor. Vehicle groups were subsequently classified at WIM sites using a K-mean clustering process based on the vehicle loads to calculate the average tonnage of the truck. In addition, the empty vehicle weight was measured for different vehicle categories, applying Gaussian gross tonnage distribution. Finally, the average truck tonnage was calculated using a weighted mean method. The above methodology was applied to the 2012 and 2017 WIM data as a case study of truck tonnage estimation in Florida. It was validated against FDOT's current method using the 2012 FAF data. The proposed model could shed light on freight mobility's statewide performance evaluation.

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List of Acronyms

AADT	Annual Average Daily Traffic
ATRI	American Transportation Research Institute
BTS	Bureau of Transportation Statistics
CFS	Commodity Flow Survey
CTMT	Combination Truck Miles Traveled
DOT	Department of Transportation
FAF	Freight Analysis Framework
FDOT	Florida Department of Transportation
FSUTMS	Florida Statewide Urban Transportation Modeling System
FHWA	Federal Highway Administration
O/D	Origin/Destination
ODME	Origin-Destination Matrix Estimation
RCI	Roadway Characteristics Inventory
SHA	State Highway Administration
TAZs	Traffic Analysis Zones
TTMS	Telemetric Traffic Monitoring Sites
VMT	Vehicle Miles Traveled
WIM	Weigh in Motion

1. Introduction

1.1. Background

Due to its large population, geographic location, and existing infrastructure and industries, freight mobility, or the movement of goods and commodities, has a significant impact on Florida's economy. It provides goods and services to not just the residents and visitors of Florida, but also other states and countries (Florida Department of Transportation, 2013). The economic growth of Florida will continue to exceed national average rates, with an estimated average increase in GDP of 3.2% from 2015 to 2018 and Florida's rate of population growth since 2000 nearly double the national average. Reaching almost 20 million in 2015, Florida's population is expected to increase 37%, attaining over 27 million persons by 2045 (Forecasting and Trends Office, 2018).

Over the last few decades, the demand for freight transportation in Florida has grown significantly, and freight demand is projected to further increase by about 40 percent by 2040 according to the Florida Transportation Plan. Truck is the top transportation mode for outbound, inbound, internal, and through freight movements nationally and in Florida. According to the Bureau of Transportation Statistics (Bureau of Transportation Statistics, 2018), truck movements account for about 70 percent of commodity movements by weight and value in 2017. FDOT's study, *Truck Empty Backhaul* (Transportation Data and Analytics Office, 2018), estimated that approximately 33 million domestic outbound tonnages were transferred by truck in Florida, which was more than 70% of the total tonnage. The other two most common modes were Rail (13%) and Multiple Modes and Mail (10%). An accurate calculation of truck tonnage would support effective decision making in transportation planning, maintenance, and operations.

Although a review of available literature provides some potential truck tonnage estimation methodologies, it is noticeable that no two states have the same measures on truck tonnage (Sarawut, Ryu, & Chen, 2017). In most cases, there are wide differences in the freight estimation metrics, with different sources and databases. The three most widely-used commodity flow datasets in truck tonnage are the Freight Analysis Framework (FAF) dataset from Federal Highway Administration (FHWA), the IHS-Global Insight TRANSEARCH dataset, and the Weigh in Motion (WIM) dataset.

Truck tonnage estimation is a methodology for estimating and measuring the total weight of freight transported by truck. The Mobility Measures Program within the FDOT produces *The FDOT Source Book* annually that reports sixty mobility measures to evaluate Florida's transportation system performance in terms of mobility. Twenty of the 60 measures are freight related to underscore the importance of freight movements on Florida's transportation network. One such measure is truck freight tonnage. *The FDOT Source Book* defines truck tonnage as the total weight in tons shipped, carried, or produced. This quantity is reported each year (Forecasting and Trends Office, 2018). Several data sources like FAF, Annual Average Daily Traffic (AADT), and WIM are combined to capture freight tonnage. The FAF data are mostly derived from two general sources. Regarding the freight movements, FAF uses Highway Performance Monitoring System (HPMS), which assembles the freight corridors and freight movements by the use of HPMS passenger traffic data (HPMS Reassessment 2010+, Highway Policy Information Office, and FHWA). HPMS is updated annually. In terms of tonnage, FAF is basically getting its data from the FHWA's Commodity Flow Survey (CFS) that is conducted every five years. Given the nature of the survey, fruition takes about seven to eight years. By the time the final data are available, a few years have already passed. From one survey to the next, the data become outdated. To get a better handle of the issue, FDOT commenced this research to find out if there are better methodologies out there to calculate truck tonnage and discover how to make the current formula more accurate.

1.2. Objective

The primary objective of this study is to evaluate the current methodologies for estimating truck tonnage through a literature review and identify alternatives that can improve Florida's current truck tonnage formula. The development of a new truck tonnage model is also an option.

Firstly, all the prominent, relevant, and available research reports and datasets on the national/state level were collected and analyzed, through which the advantages and disadvantages of different methods could be determined. Through this analysis, this research would identify which method(s) best corresponded to the state of Florida, could be easily updated to represent current conditions, and could be more efficiently and accurately utilized for estimating truck tonnage volumes. Secondly, based on this analysis, a conceptual and methodological framework would be developed to provide general guidelines that could be implemented for the improvement or development of truck tonnage. This research could provide the required modifications to the truck tonnage model to make them more precise and accurate. Also, state authorities could more effectively plan their actions, conduct reliable forecasting, and adjust their operations to provide competitive services and improve transportation conditions for the public.

A conceptual and methodological framework was developed to provide general guidelines that can be implemented for the improvement or development of truck tonnage calculation (Figure 1-1). This report is organized as follows. Section 2 describes the literature review and data sets. Section 3 introduces the WIM data system. Sections 4 describe the new methodology in detail. Section 5 evaluates the proposed methodology. Finally, Section 6 presents research conclusions.

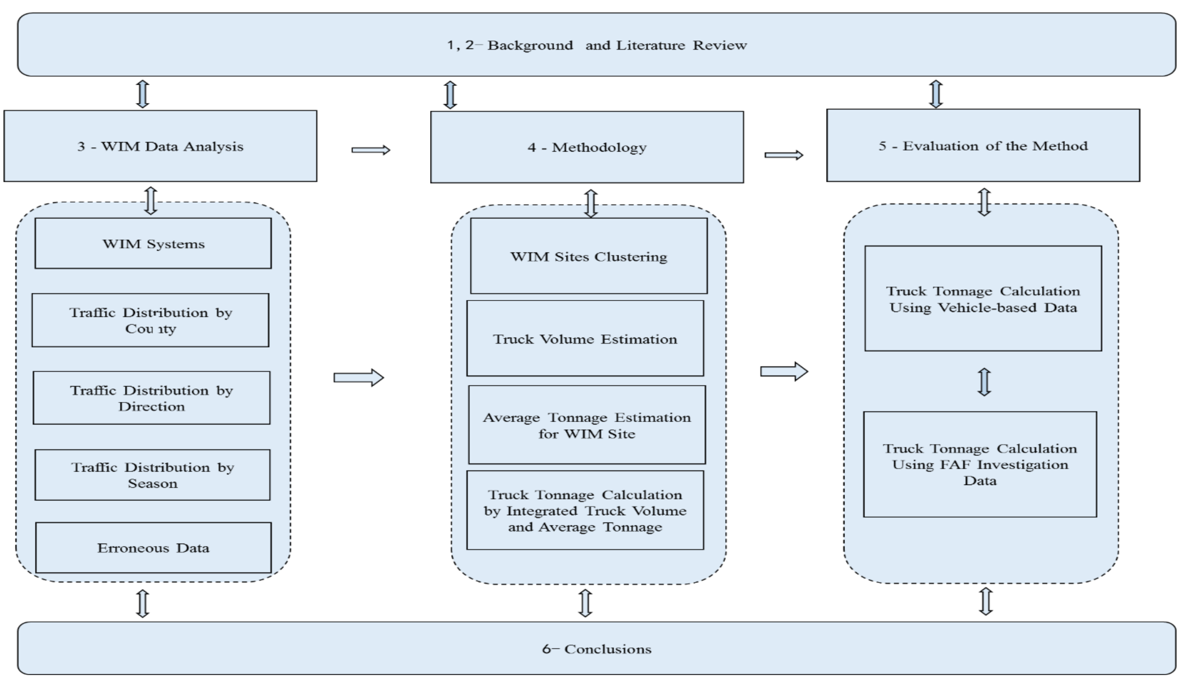


Figure 1-1. The Research Framework

2. Literature Review

Most state departments of transportation (DOTs) track general performance measures. Only a few have a robust freight performance measurement system in place. States like Florida, Maryland, Minnesota, Ohio, Oregon, and Washington, have well-established freight programs that offer lessons learned. In this research, we highlight those states that track truck tonnages.

2.1. Methods of Truck Tonnage Calculation in Different States

2.1.1 State of Florida

Total gross tonnage is calculated by the Forecasting and Trends Office in its annual *The FDOT Source Book*. The existing method uses the FAF as its primary data source, and WIM and Combination Truck Miles Traveled (CTMT) as datasets to refine it. The 2012 tonnage values are obtained from FAF as the sum of all truck tonnage (internal, inbound and outbound) in Florida. This value is then weighted using two factors – a Truck Load factor and a Combination Truck Miles Traveled factor. The truck tonnage formula is as follows.

$$\text{Tonnage}_{20xx} = \text{Tonnage}_{2012} \times \left(\frac{\text{Avg. LoadoffullCombTR}_{20xx}}{\text{Avg. LoadoffullCombTR}_{2012}}\right) \times \left(\frac{\text{CTMT}_{20xx}}{\text{CTMT}_{2012}}\right)$$

Based on this formula, Tonnage 2012 is equal to 580,470,733 tons according to the 2012 FAF. The FAF data is updated every five years, with the most recently available years being 2007 and 2012. For estimating the amount of cargo shipped after 2012, interpolation is needed.

The Average Load of Full Combination Trucks (AvgLoadofFullCombTR - combination truck: Class 8 and above based on FHWA vehicle classification) should be calculated by subtracting the average weight of full combination truck from the average weight of empty combination truck. The average weight of a full combination truck is the average weight of all combination trucks whose weight is greater than 40,000 lbs. and the average weight of the empty combination truck is the average weight of all combination trucks whose weight is less than 40,000 lbs. These data can be obtained from the WIM dataset, which is available yearly (Office of Highway Policy Information, 2014).

$$\begin{aligned}\text{AvgLoadofFullCombTR} = {} & \text{Average Weight of Full Combination Truck -} \\ & \text{Average Weight of Empty Combination Truck}\end{aligned}$$

To this end, CTMT is computed by multiplying Vehicle Miles Traveled (VMT) by the combination truck factor. The combination truck factor is provided by the Transportation Data and Analytics office of FDOT on a county-by-county basis and represents the proportion of heavy vehicles that are combination trucks. The Reporting Period of CTMT is daily and is computed as follows:

$$\text{CTMT} = \sum(\text{Segment Length} \times \text{Volume} \times \text{Combination Truck Factor}) \text{ Or}$$

$$\text{CTMT} = \sum(\text{Segment Length} \times \text{Combination Truck Volume})$$

The peak hour volume was calculated by multiplying the AADT and the highest hourly factor (Forecasting and Trends Office, 2018). The VMT was determined using vehicle traffic volume and segment length. The number of VMT was based on data obtained from traffic monitoring sites and FDOT's Roadway Characteristics Inventory (RCI) Feature 111 data.

VMT is calculated by multiplying the amount of daily traffic on a roadway segment by the length of the segment, then adding all the segments' VMT. The vehicular traffic amounts are estimating current or past data.

$$VMT = \Sigma \text{ (Segment Length} \times \text{Volume)}$$

2.1.2 State of Iowa

Truck Forecasting Model (Smadi, 1994) was developed for statewide planning of truck commodity flows. The model was a commodity-based, sequential network model at the state level. The approach was to model individual commodities independently, thereby reducing data and modeling requirements. The only mode included in the model was truck. The network was composed of the major routes in Iowa and major nodes (cities) outside of Iowa. The network included a node in all counties and sub-nodes at major producers or attractions of freight. The total freight tonnage produced and attracted in each sector is tabulated for all of the zones. Next, the rail commodity flows compiled from the waybill sample are summarized into originating and terminating tonnage for these zones. The originating tonnage is the amount of freight (in tons) shipped by rail from a certain zone. Similarly, the terminating tonnage refers to the amount of freight shipped to that zone using rail. An estimate of truck tonnage is obtained by subtracting the observed rail tonnage from the total freight generated in an area. This approach was used because of the lack of modal performance data. In the case when modal division data for commodity groups are available, the total freight tonnage is allocated to competing modes accordingly.

The calculation of truck freight tonnage produced within a zone was the total commodity tonnage produced within the zone less than the rail tonnage originating in that zone. Similarly, the attracted truck freight tonnage was equal to the attracted commodity tonnage less than the terminating rail tonnage. Rail commodity flows were obtained from the 1989 Waybill sample. The process of estimating truck tonnage was straightforward and included minimal calculations. The commodity tonnage produced at the analysis zones was tabulated for the nine commodities included in the analysis. Corresponding rail commodity flows originating in these zones were subtracted from total production tonnage. Likewise, the truck tonnage attracted to a zone was estimated by subtracting the terminating rail tonnage from the total attracted freight tonnage at that zone. The attracted freight tonnage included personal consumption and input freight requirements. Estimated truck volumes on network links were compared to actual truck counts on comparable locations on the state highway network (Iowa in Motion, 2016).

2.1.3 State of Maryland

The Maryland State Highway Administration (MSHA) maintains a traffic monitoring system to collect traffic volume data and to calculate AADT and Annual Average Daily Truck Traffic (AADTT) counts on the state’s highways. Building on the highway traffic and truck count data, the MSHA used the TRANSEARCH database that provided some insight into the origin-destination patterns of truck movements to, from, through and within the state. Total truck tonnage was estimated on Maryland highways in the base year and the forecast year, respectively (Cambridge Systematics, Inc. , 2010).

- Base and Forecast Years. The base year used for all freight data was 2006, the forecast horizon was 2035. In 2006, the most heavily utilized corridors through traffic were identified. By 2035, several other key corridors were projected to emerge as significant through-traffic routes. Also, truck tonnage forecasts showed heavy flows concentration.

- The average growth in the forecast was conservative, following a long-term trend of between two and three percent average annual growth of the economy. Consequently, the estimation did not adjust for the high growth freight years between 2003 and 2007 (above six percent annual growth). Instead, a steady long-term growth curve was provided (Zhang, Bowden, & Allen, 2003).

In the MDOT Excellerator Performance Management System (Maryland Performance Management System, 2017), truck tonnage data was estimated based on FAF3 data. The data was adjusted yearly to account for previous year actual data and a 2% annual growth rate consistent with the FHWA's Freight Summary 2008. The 2% growth rate reflected a conservative estimate of domestic and international freight growth given current economic conditions.

2.1.4 State of North Carolina

The North Carolina Statewide Multimodal Freight Plan disaggregated 2012-2045 FAF4.1 data of the four North Carolina FAF regions to obtain truck, water, air, pipeline, and other flows at the county level. Disaggregation of commodity flows at the county level allows for the many types of analyses, including tonnage by mode, the direction of goods, and commodities by tonnage. The FAF or TRANSEARCH data can be used to derive more detailed commodity flows. The FAF data can be post-processed in various ways to estimate more granular freight movement patterns (Stone, Mei, Demers, & Paladugu, 2009).

The disaggregation factors for border crossing were based on the reported trucks or trains, as appropriate; trucks were used to disaggregate flows where truck was the mode to transport foreign trade commodities. To support the 2011 FAF Geospatial project for FHWA, the disaggregation code was rewritten in TransCAD. The output, to support the FAF Geospatial assignment to the FAF highway network, was converted from annual tons by all modes to daily trucks.

To support the North Carolina Statewide Multimodal Freight Plan, this TransCAD code was re-written to output not trucks, but tons by all modes. To maintain consistency with the region-to-region FAF4, the output from TransCAD was exported as a CSV file that could be imported into MS Access. Once in MS Access, the mode shares by Origin region, Destination region, and Standard Classification of Transported Goods (SCTG2) commodity was applied to all of the Origin county, Destination county, and SCTG2 commodity flows within that FAF region (RS&H Architects-Engineers-Planners, Inc. and Kimely-Horn & Associates, 2011).

TransCAD was used for implementing the matrix estimation process. It was an integrated transportation software package that could be used as a tool to help estimate not only link volumes and turning movements for current year networks but also future year traffic based on changes in variables. TransCAD suggested a set of tools for modeling commodity flows and truck movements wherever truck traffic could be easily assigned to the transportation network (Cambridge Systematics, Inc., 2017).

2.1.5 State of Washington

The freight transportation system plays a critical role in Washington State as it is one of the most trade-dependent states in the nation. Washington State Freight System Plan provides information on the importance of freight to the economy of the state, the regions, and the local communities; analysis of freight volume; forecast for freight demand; and information on the major freight trends, issues, and needs.

In order to accurately estimate the truck tonnage on freight routes, Washington State Department of Transportation (WSDOT) has been applying the following procedure. The estimation of truck tonnage in this methodology is based on truck volume. WSDOT does not use FAF or TRANSEARCH to calculate truck freight tonnage. Truck freight tonnage values are instead derived from actual or estimated truck traffic counts and converted into average weights by truck type. The annual truck tonnage for a specific route is estimated using the AADT, truck percentage, truck type, average truck type tonnage, and working days per year. In some locations where there is not a classification counter or other appropriate technology, the truck volume is estimated based on the truck percentage data obtained from adjacent classification counters. To assist in calculating annual tonnage, trucks are divided into three categories as given below.

- Single Units: A single vehicle that carries cargo on the same chassis as the power unit and cab, regardless of the number of axles. FHWA vehicle classes 4 to 7 are considered as single unit trucks. The average total weight used is seven tons.
- Double Units: A 2-unit vehicle, normally a truck and trailer with four to six axles. This category includes FHWA vehicle class 8 to 10. Average total weight used is 27 tons.
- Triple Units (Trains): Normally, a tractor and two trailers. This category includes FHWA vehicle classes 11 to 13. The average total weight used is 42 tons.

Freight in tons per year = {ADT × percent of total trucks × percent of trucks that are singles × average gross weight for singles × 250 working days per year}

+ {ADT × percent of total trucks × percent of trucks that are doubles × average gross weight for doubles × 250 working days per year}

+ {ADT × percent of total trucks × percent of trucks that are trains × average gross weight for trains × 250 working days per year}

Truck volume data for state highways were obtained from WSDOT traffic counters. There was a total of 4,154 traffic counts used on state highways to estimate the 2017 Freight and Goods Transportation System (FGTS) classification. Of these, 44 percent (1,812 traffic counts) had truck classification data. The other 56 percent (2,342 traffic counts) only provided total traffic volume data (Washington State Department of Transportation, 2018).

2.2. Other Methods of Truck Tonnage Calculation

In addition to the existing methods mentioned above, there are other general methods to monitor truck freight tonnage in these states (Table 2-1). This section is devoted to a review of different methodology on calculating freight model of truck tonnage.

Table 2-1. Comparison of Modeling Methodologies between Different States

State	Dataset	Modeling Methodology	Variables Used	Disadvantages
State of Florida	FAF, WIM, AADT	Truck tonnage in base year plus calibration factor	Truck tonnage of base year, combination truck miles traveled factor and an average truck load factor	The data of the base year is too old
State of Iowa	Rail Waybill Data	Estimate of truck tonnage is obtained by subtracting the observed rail tonnage from the total freight generated in an area	Rail tonnage	The method is old, and lack of performance data
State of Maryland	FAF	Truck tonnage in base year plus calibration factor	Truck tonnage of base year, freight annual growth rate	The data of the base year is too old, the calibration factor is simple and rough
State of North Carolina	FAF	Disaggregation of the FAF Database	Truck tonnage, disaggregation factors	Converted from annual tons by all modes to daily trucks
State of Washington	AADT, Truck Traffic Count Data	Convert traffic count data to average gross annual tons	AADT, truck type and percentage, average annual truck type tonnage, truck working days per year	Short duration counts must be adjusted to annual conditions

2.2.1 Using Weigh in Motion Only

There may be advantages in monitoring pure weights recorded by WIM stations, especially considering it captures tonnage from a different vantage point than FAF and TRANSEARCH. WIM can be used to track tonnage trends: For instance, assuming that a combination truck has cargo when its total weight is 40,000 lbs. or larger, the cargo weight can be determined as the difference between gross weight minus 40,000 lbs. Although WIM stations reflect only a sample of freight movement in Florida, the year-to-year tonnage values derived from it would be helpful in understanding statewide tonnage trends.

WIM stations may capture the actual weight of cargo that is not considered freight – for instance, a truck moves from one location of a firm to another location of the same firm (e.g., Publix distribution center to a Publix store).

2.2.2 Origin-Destination Matrix Estimation

Origin-Destination Matrix Estimation (ODME) is a process that is typically used to estimate an origin-destination (O-D) trip table, matrix, using observed traffic counts.

Although this method is most commonly used with a truck vehicle O-D table and truck vehicle counts tonnage table could be utilized as the seed, and tonnages could be considered as counts. The primary inputs to the procedure were the seed matrix, which is essentially the matrix of O-D truck trip flows derived from ATRI's truck GPS data (R. Pinjari, Bakhshi Zanjani, Thakur, Irmania, & Kamali, 2014). This kind of data fusion method also can be applied to truck tonnage calculation. For example, the seed table could be the tonnage flows from TRANSEARCH and the observed counts could be the annual tonnages observed at the WIM stations. Because the flow unit would not be consistent with the capacity of the roadways, a simple assignment process, e.g., All-Or-Nothing, could be used with the ODME. The result would be an O-D table that is consistent with the tonnage observed at each WIM station (Eluru, et al., 2018).

In order to use this process, the zones in the O-D commodity tonnage table would need to be made consistent with the Traffic Analysis Zones (TAZs) used in Florida Statewide Urban Transportation Modeling System (FSUTMS). While it might be desirable to update the seed tonnage table each year, this is not necessary as long as the O-D pattern is expected to remain stable. The output O-D tonnage table would, however, be updated to reflect whatever WIM tonnages are used as constraints. If these WIM tonnages are for the most recent year, then the resulting matrix would also be for that most recent year. The TAZs in the resulting table could be summarized for any aggregation that is desired, e.g., Florida origins and/or destinations.

While this process is more complex, it is similar in concept to the description of the Existing Method. However, rather than factoring FAF based on changes in truck VMT and WIM counts, it would factor the commodity O-D table, e.g., the FAF, to the absolute value of WIM counts.

2.3. Data Sources for Truck Tonnage Calculation

Different data sources that can be used for a freight flow study have widely varied degrees of coverage, accuracy, aggregation, and completeness. A variety of data sources have been used in the research of truck tonnage. A list and a succinct description of different databases' availability and applicability for statewide transportation planning are provided (Table 2-2).

Table 2-2. Data Source Characteristics

Data Sources	Sponsor	Data Description	Spatial Aggregation	Frequency Availability
Freight Analysis Framework (FAF)	U.S. Department of Transportation	Integrates data from a variety of sources to create a complete view of freight movement by all modes of transportation among states and major metropolitan areas. FAF incorporates data from various sectors based on the 2012 Commodity Flow Survey (CFS) and international trade data from the Census Bureau.	State and Region	Every 5-years
TRANSEARCH	IHS Global Insight	Identifies transportation demand by commodity, location, and mode. TRANSEARCH finds transportation statistics by country and state.	State and corridors	Annually
Weigh in Motion (WIM)	FDOT	Weigh in Motion devices are designed to capture and record truck axle weights and gross vehicle weights as they drive over a sensor.	State and Corridor	Weekly
American Transportation Research Institute (ATRI)	American Transportation Research Institute	Examines the pure movement of trucks based on truck GPS	North America	Real-time data
Annual Average Daily Traffic (AADT)	FDOT	AADT volumes for last 10 years, average weekday traffic volume and 13 vehicle classifications	State and Corridors	Annually

2.3.1 Freight Analysis Framework (FAF)

Freight Analysis Framework (FAF), created a detailed picture of freight movement among states and major metropolitan areas with a partnership between the Bureau of Transportation Statistics (BTS) and FHWA. The FAF dataset is based primarily on the Commodity Flow Survey (CFS). The CFS is a shipper-based survey, and that captures data on shipments originating from select types of business. FAF presents tonnage and value estimates by commodity types, modes, and origins and destinations. It provides annual estimates for years in between the CFS and presents long-range (30 years) forecasts in 5-year increments. Starting with data from the 2012 CFS and international trade data from the Census Bureau, FAF incorporates data from agriculture, extraction, utility, construction, service, and other sectors. The FAF version 4 (FAF4) baseline edition provides estimates for tonnage and value by regions of origin and destination, commodity type, and mode for 2012, the most recent CFS year. This includes improvements to data collection, data editing, and an expanded number of geographic areas (U.S. Department of Transportation, 2018).

In terms of the geographic dimension, FAF4 presents freight trading information between 132 domestic zones and eight foreign zones (Oak Ridge National Laboratory, 2019).

2.3.2 TRANSEARCH

Global Insight's TRANSEARCH data provides U.S. county-level freight-movement data by commodity group and mode of transportation for state freight planning purposes. It presents detailed information on commodity type (as per Standard Transportation Commodity Classification), tonnage, value, ton-mile, origin-destination and mode used for freight movement. This data combines information from public sources and data for primary shipments from major carriers. Data are available for 38 commodity groups for truck, rail, and water freight. Proprietary data from other IHS-Global Insight divisions are used to further enhance the dataset. The data set is commercial and is available for purchase only. Historical data are also available (IHS Markit, 2019).

A TRANSEARCH domestic commodity flow database for the state of Florida was purchased from IHS/Global Insight by FDOT for the year 2011. In addition to the base year data, the database also provided projection till 2040 at a five-year interval starting from 2015.

2.3.3 Weigh in Motion (WIM)

The primary purpose of the use of WIM stations is to help manage wear and tear of the asphalt by enforcing weight limits on trucks. Florida has 37 state-of-the-art WIM stations throughout the state. While they are used "to protect Florida's highway system and bridge from damage from overweight vehicles," the data recorded by Florida's WIM stations is rich and granular, with potential additional uses. The FDOT WIM dataset, stored in an Oracle database, includes WIM site, vehicle type, gross weight, axle weight, vehicle length, inter-axle spacing, and speed. These and other attributes are recorded for every single vehicle that goes through a WIM station in Florida.

The WIM data are collected at some of the Telemetric Traffic Monitoring Sites (TTMS) that can weigh the vehicle passing through the site. All sites with WIM capability measure the weight and classification (i.e., number of axles, etc.) of all the trucks passing through the sites throughout the year (unless the site malfunctions on certain days). Each record in the WIM data is an instance of a truck passing through a WIM site. For each such record, the WIM data provided by FDOT contains attributes describing the WIM site as well as the truck passing through the site. Four attributes - county code, unit number, the direction of the weight, and the number of lanes - are specific to the WIM site. The remaining four attributes, namely the date, time interval, vehicle classification, and the gross weight of the truck, are specific to individual trucks passing through the WIM site.

2.3.4 American Transportation Research Institute (ATRI)

ATRI provides GPS-based spatial and temporal information for a large sample of trucks with onboard, wireless communication systems in the U.S. Data includes geospatial (coordinates) and temporal (time/date stamp) information for the corresponding trucks. ATRI examines the pure movement of trucks, whether or not those trucks carry freight. ATRI's origin-destination data is based on truck GPS, with no way to determine if the truck is empty or full, or the ultimate origin and destination of the goods it carries.

2.3.5 Commodity Flow Survey (CFS)

The CFS is a shipper-based survey that is conducted by the BTS and the U.S. Census Bureau every five years. The commodity flow data are directly related to freight flow analysis, which includes such data as the type of commodity, the origin, the destination, the value, the weight, and the ton-miles of the shipments. Results from the CFS are used to analyze trends in the movement of goods, mapping spatial patterns of commodity and vehicle flows, forecasting demands for the movement of goods, and for guiding management and investment decisions on transportation infrastructure. These data are usually aggregated at the state level by the Bureau of Economic Analysis (BEA) Zones and FAF regions. To analyze the statewide freight transportation characteristics, a methodology is needed to disaggregate these data to a sub-regional level (Office of Economic and, 2018).

2.3.6 Annual Average Daily Truck Traffic

Annual Average Daily Truck Traffic (AADTT) is the total truck traffic volume divided by 365 days. It is the total volume of truck traffic on a highway segment for one year. This number is determined as a percentage of AADT.

2.4. Summary

To summarize, we find that it is difficult to compare the calculation methods of truck tonnage since not all states are using the same data sources. Some states have the funds to purchase additional data, while others use free sources of data or data obtained from other departments or agencies to analyze and produce truck tonnage measures within their limited budget. Additionally, the scales of infrastructure can vary greatly from state to state. Nevertheless, the advantages and disadvantages of methods calculating truck tonnage can be identified.

Multi-source data sets are used to calculate the truck tonnage in FDOT, for example, FAF, WIM, and AADT. The truck tonnage can be reflected with a comprehensive perspective: a combination of the commodity flow-based and vehicle-based characteristics. There are limitations in using FAF:

- As mentioned earlier, the FAF dataset is based primarily on the five-year Commodity Flow Survey (CFS). Because of the nature of the survey, it takes about seven to eight years to be completed. Therefore, a couple of years have passed by the time the final data are available. The data become out-of-date from one survey to the next.

- FAF focuses on inter-county movements of commodities by truck, but not intra-county movements, which means that only domestic shipments from the CFS are used in constructing the FAF. Meanwhile, CFS contains only two-thirds of the weight of all commodity movements. Shipments from industries classified in transportation, construction, most retail and service industries, farms, fisheries, foreign establishments (imports), petroleum and natural gas extraction, municipal solid waste, logging, as well as household and business moves are not covered by the CFS (Hwang, et al., 2016).
- FAF-Based method calculates only combination trucks (Class 8-13), which don't include the comprehensive truck tonnage.
- FAF estimates truck tonnage for states and state portions of large metropolitan areas. Local data to support local applications are not considered, particularly in regions with multiple routes or significant local traffic between major centers of freight activity (Federal Highway Administration, 2012).

Vehicle-based data is used to calculate the truck tonnage in WSDOT. This method is restricted to three types of trucks (Single Unit, Double Unit, and Triple Unit). However, the total tonnage is calculated according to the approximate average gross weight of each type of truck.

The next step is to combine the advantages of each methodology and offset the weaknesses so that we can develop a method to improve Florida's truck tonnage methodology.

3. Data Handling of Weigh in Motion (WIM)

The methods used in the analysis to process the WIM data are presented in this chapter. It starts with an introduction to the WIM system, followed by analyses of traffic distribution of WIM by site, by direction, and by season.

3.1 WIM Systems

WIM is a state-of-the-art system to collect, store, process and transmit vehicular data from key locations on the Florida State Highway System. The WIM data are collected at some of the Telemetric Traffic Monitoring Sites (TTMS) that can weigh the vehicle passing through. FDOT's Transportation Data and Analytics (TDA) Office maintains an Oracle database that stores per-vehicle, time-stamped WIM data. In 2018, there were 373 TTMS sites, and 37 of them served as WIM sites. Figure 3-1 shows the locations of WIM sites in Florida.

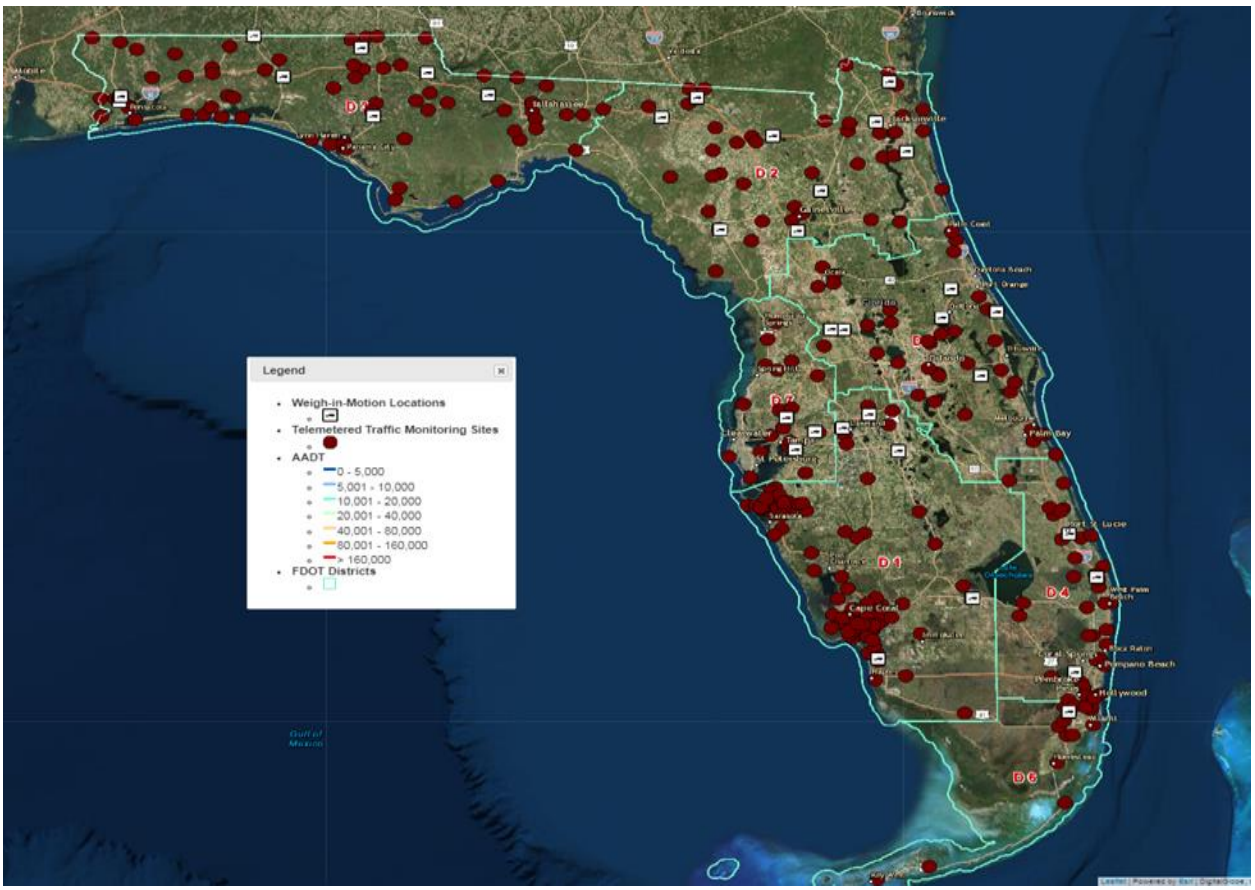


Figure 3-1. Weigh in Motion Locations in Florida

The WIM Systems shall include equipment and software for collecting, processing, storing, transmitting and manipulating information related to the counting, classifying and speed monitoring of all vehicles and the weighing of trucks and buses at highway speeds.

The WIM systems generate various data components for each vehicle passing through the site. The WIM controller shall store the data including hourly vehicle counts by lane, by class and by speed range for each 24-hour period (Class/Count Summary). Individual vehicle records include all vehicles with a front axle weight greater than 3.5 kips (hereafter referred to as "truck records").

The front axle weight threshold for truck records shall be programmable by the operator with 3.5 kips as a default setting. Each truck record shall include, at a minimum, time and date, lane number, vehicle number, speed, vehicle classification, wheel load, axle load, axle group load, gross vehicle weight, spacing in feet between each sequentially numbered axle, overall length of each vehicle or combination of vehicles in feet, and code for weight violation(s) and invalid measurement(s).

Currently, there are 37 WIM stations installed within the State of Florida, which collect weigh in motion data 24 hours per day, 365 days per year (Transportation Data and Analytics Office, 2018). WIM stations are maintained independently from the Office of Maintenance's weight stations.

WIM database characteristics in this study are as follow:

(1) WIM systems record instantaneous gross tonnage volume, dynamic axle loads and spacing, the number of axles, speed of vehicle, lane, and direction of travel, vehicle classification by Federal Highway Administration (FHWA), axle weights, date, and time stamp, etc. All the variables in WIM data and those used in the figures and tables in this research are described in Appendix A.

(2) The vehicle weight data are only saved for buses (Class 4), and vehicle Classes 5 and higher. For the purpose of this study, vehicle Classes 5-13 are considered, which is classified as a truck vehicle according to the vehicle classification by FHWA even though Class 4 also belongs to the truck category. Also, WIM data in 2012 were selected as the datasets in the methods analysis, because the comparison of truck tonnage calculation in this study will be made with other data sources, for example, the most recent available Freight Analysis Framework (FAF) data in 2012. To validate the new methodology, an analysis of the 2017 data was also conducted by comparing FDOT's current method using FAF and the newly developed method relying on WIM and TTMS. The gross tonnage for different vehicle classes in 2012 is illustrated in Figure 3-2. Distribution of truck tonnage weight by frequency in 2012 is shown in Appendix B.

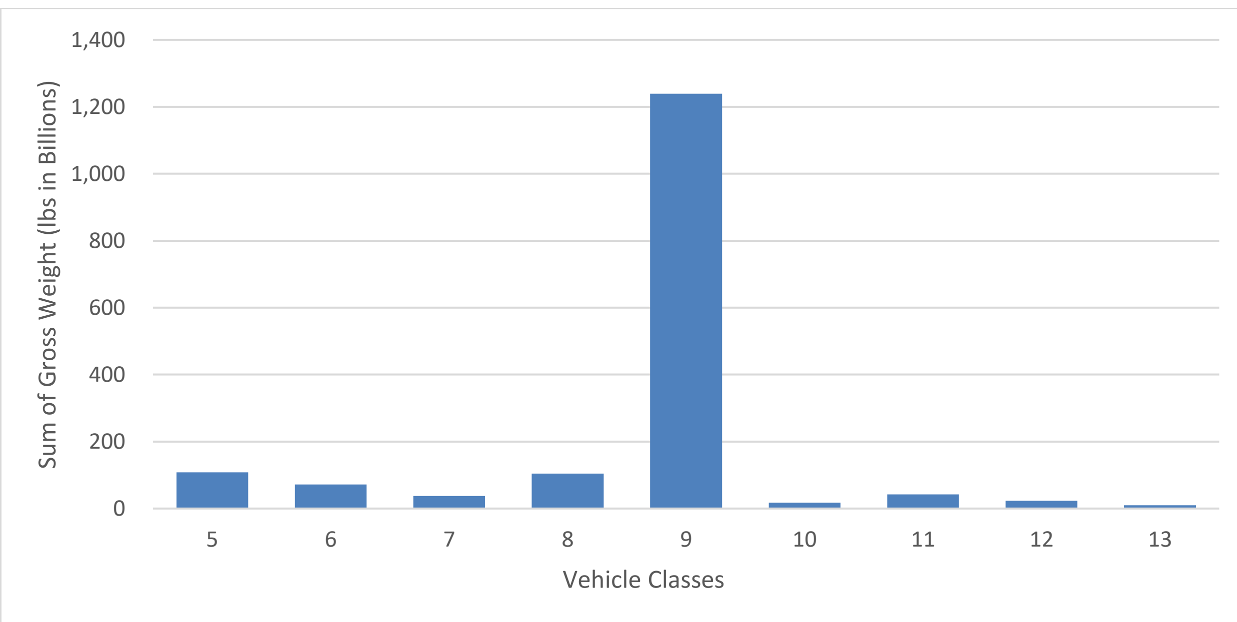


Figure 3-2. Sum of Gross Tonnage by Vehicle Class in Florida in 2012

3.2 Traffic Distribution by WIM Site

This section presents a brief descriptive analysis of the traffic site distribution using the 2012 WIM data; 33 sites are recorded in the 2012 WIM dataset. Figure 3-3 and Figure 3-4 illustrate the distribution of the sum of the gross tonnage and vehicle volume by vehicle class in different sites. The charts reveal that Class 9 had the highest volume and the greatest weight among most WIM stations. The percentages of truck tonnage and truck volume for different vehicle classes make a difference for the average tonnage for each site. For the most part, truck volume and gross weight moved in the same direction. However, there were a few exceptions. Sites 9926 and 9950 had similar traffic as their neighboring sites 9923 and 9949, respectively. Nevertheless, they witnessed lighter loads. A closer look reveals that Sites 9926 and 9950 had a lower volume in Class 9 truck traffic and a higher volume in truck traffic of other classes than Sites 9923 and 9949 even though the total volume was similar. Variations in truck and weight among the WIM sites can also provide other information regarding mobility, which is beyond the scope of this research.

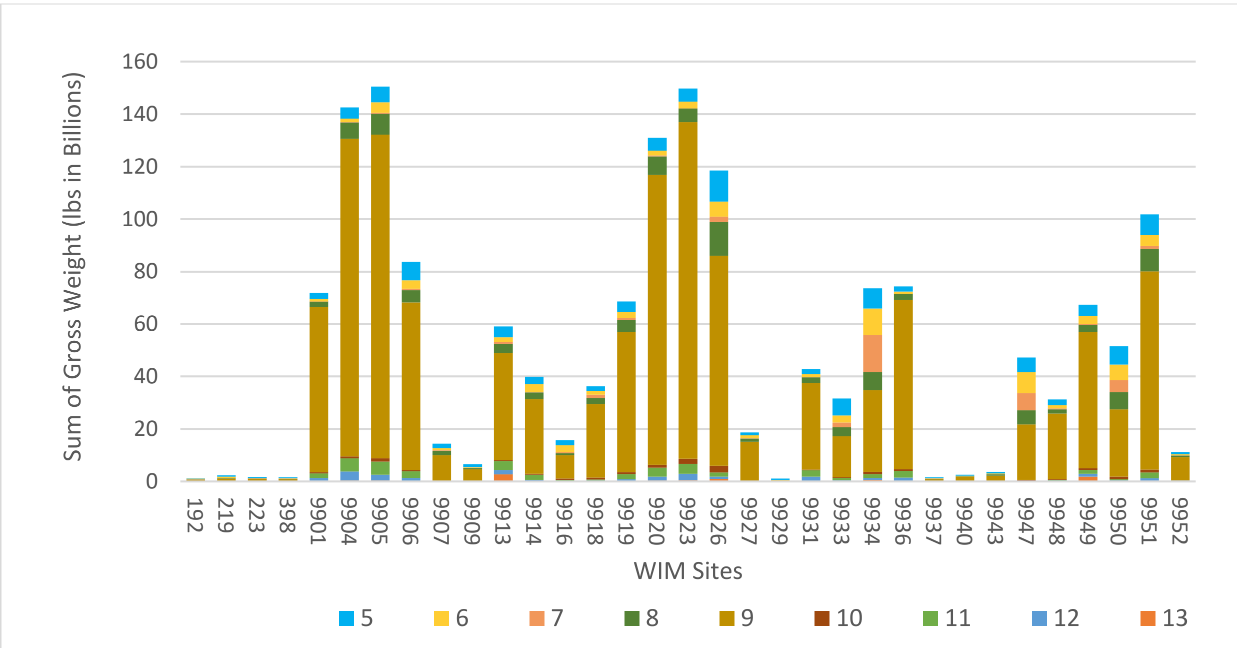


Figure 3-3. Sum of Gross Tonnage for Different Vehicle Class by WIM Site in 2012

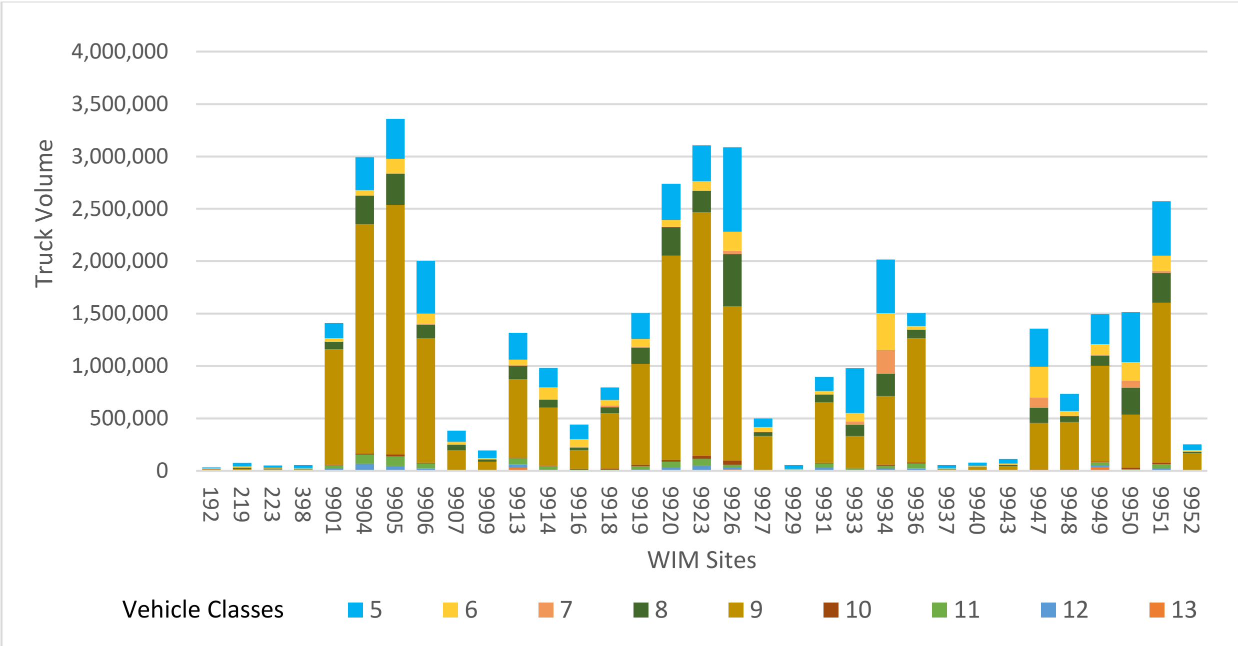


Figure 3-4. Truck Volume of WIM for Different Vehicle Class by WIM Site in 2012

It is shown in Figure 3-4 that the truck volume of Classes 5 and 9 are larger than other vehicle classes. WIM sites can be grouped preliminarily into three types according to the truck volume of Classes 5 and 9.

- Group one: The volume of Class 9 ranked the top, Class 5 ranked the second (Figure 3-5)
- Group two: The volume of Class 5 ranked the top, Class 9 ranked the second (Figure 3-6)
- Group three: The volume of Class 5 ranked the first, Class 9 ranked the third (Figure 3-7)

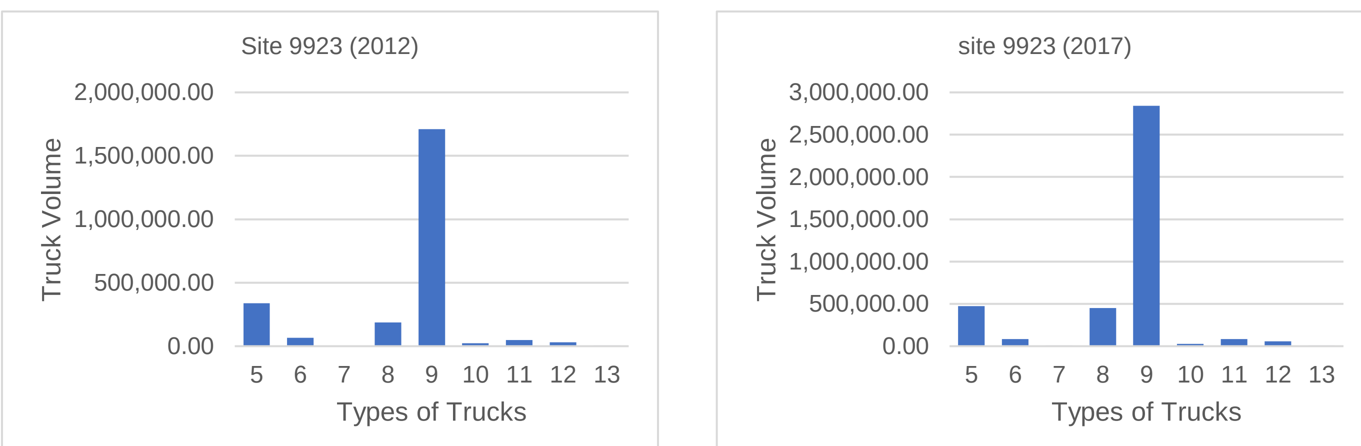


Figure 3-5. The Volume of Class 9 Ranked the Top, Class 5 Ranked the Second

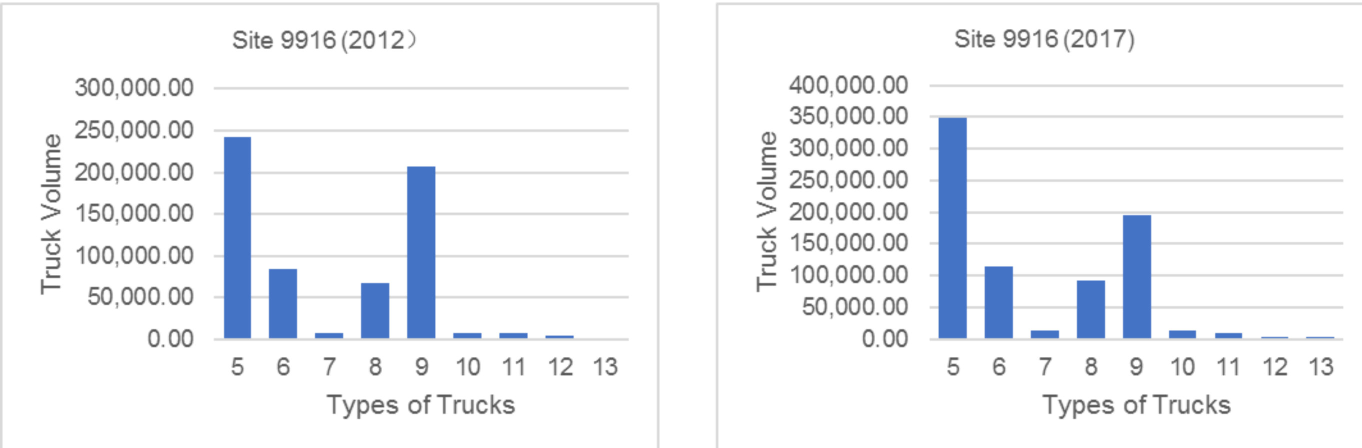


Figure 3-7. The Volume of Class 5 Ranked the Top; Class 9 Ranked the Second

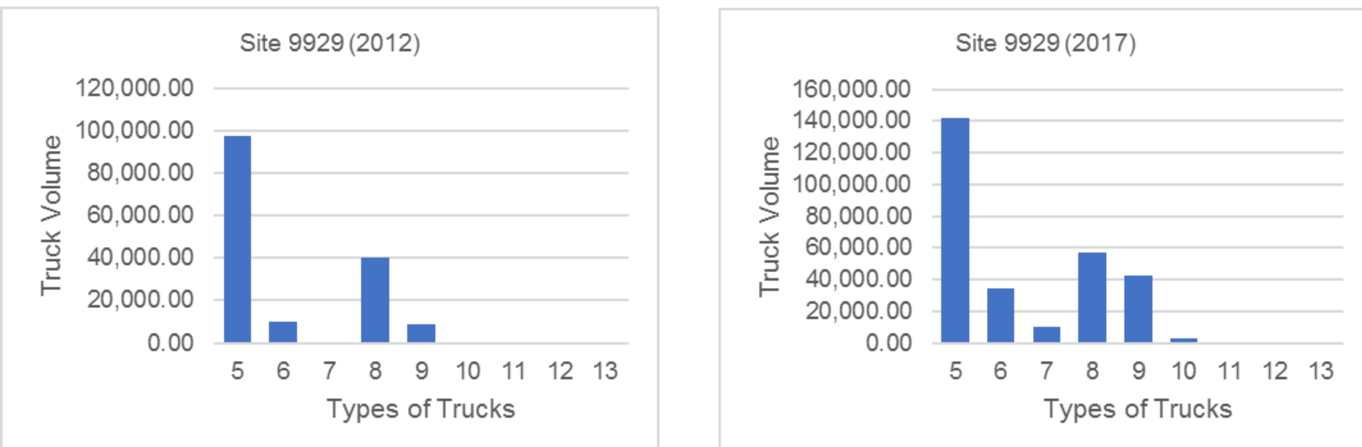


Figure 3-6. The Volume of Class 5 Ranked the First; Class 9 Ranked the Third

3.3 Traffic Distribution by Direction

This section presents a brief descriptive analysis of the traffic direction distribution using 2012 WIM data. Figure 3-8 and Figure 3-9 demonstrate the distribution of the sum of gross tonnage and vehicle volume in different directions (E-East, W-West, N-North, and S-South). A large percentage of trucks travel southbound (S) or northbound (N), especially in the south direction, which corroborated with the result of FAF4 in 2012. FAF4 reported a larger volume of the inbound (S) commodity than the outbound (N) commodity. Due to Florida’s geographic location, the eastbound and westbound freight traffic only occurred within the state.

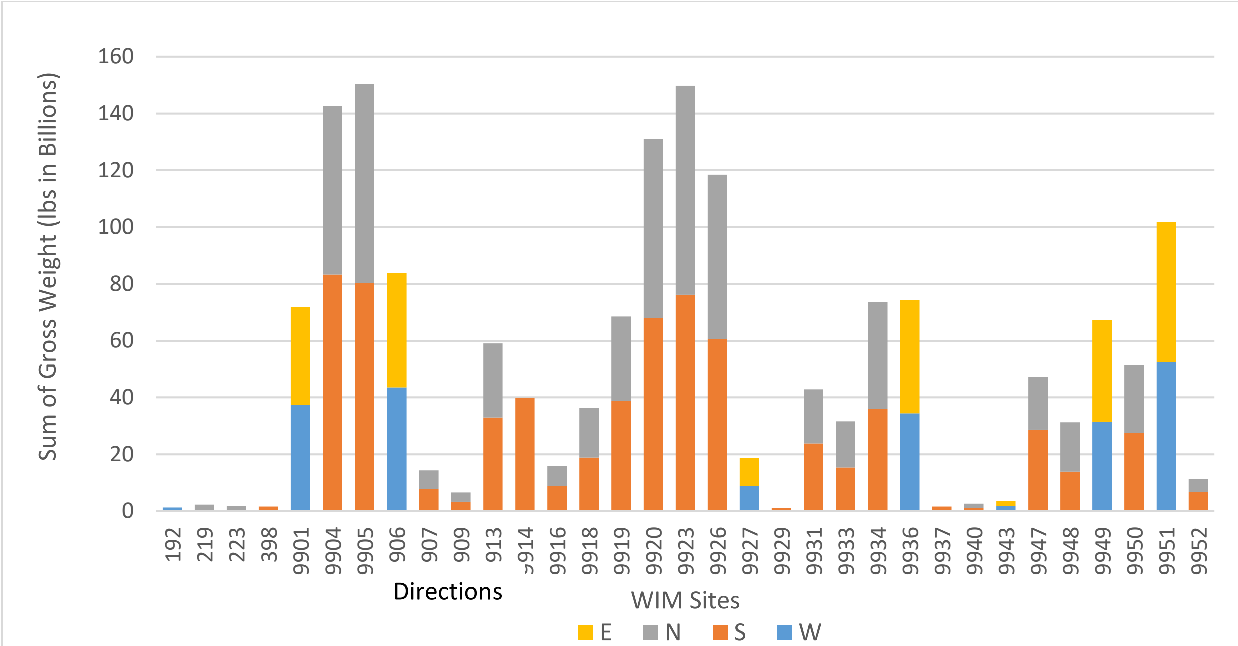


Figure 3-8. Sum of Truck Tonnage in Different Directions by WIM Site in 2012

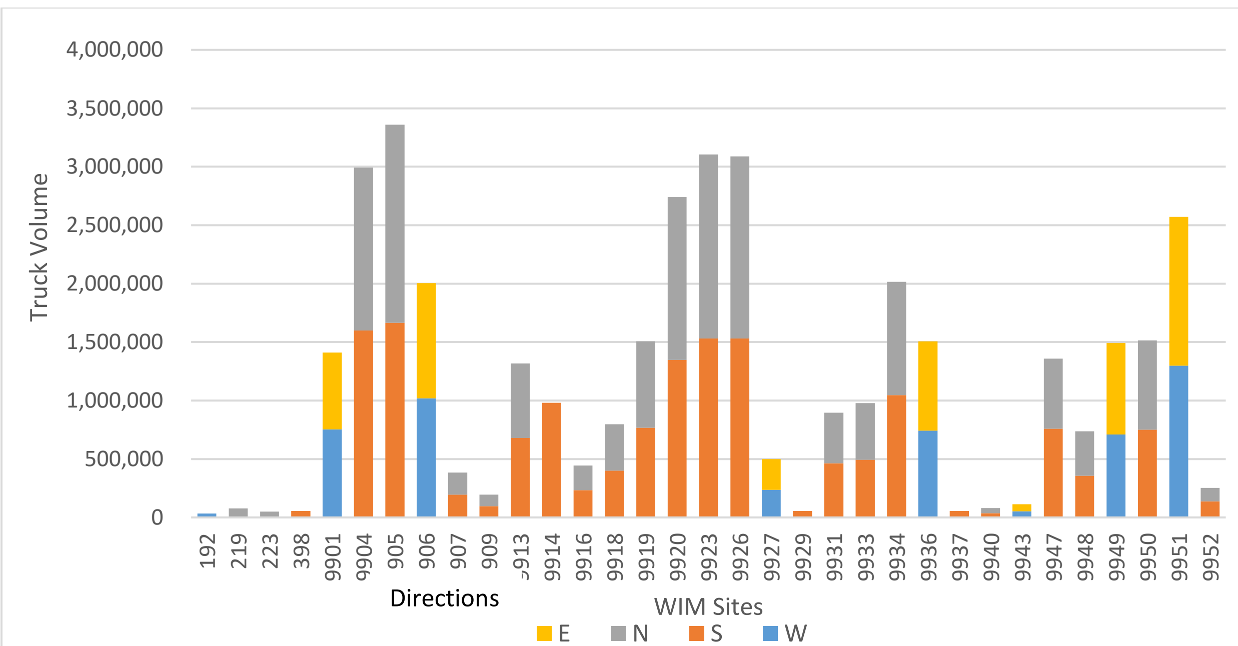


Figure 3-9. Truck Volume in Different Directions by WIM Site in 2012

3.4 Traffic Distribution by Season

The seasonal gross tonnage in 2012 is shown in Figures 3-10 and 3-11. It can be seen in Figure 3-10 and 3-11 that the sum of the gross tonnage remained stable except in December, and December 15th is the peak day. More detailed analysis of the average truck tonnage weight by month for different vehicle classes is summarized in Appendix C.

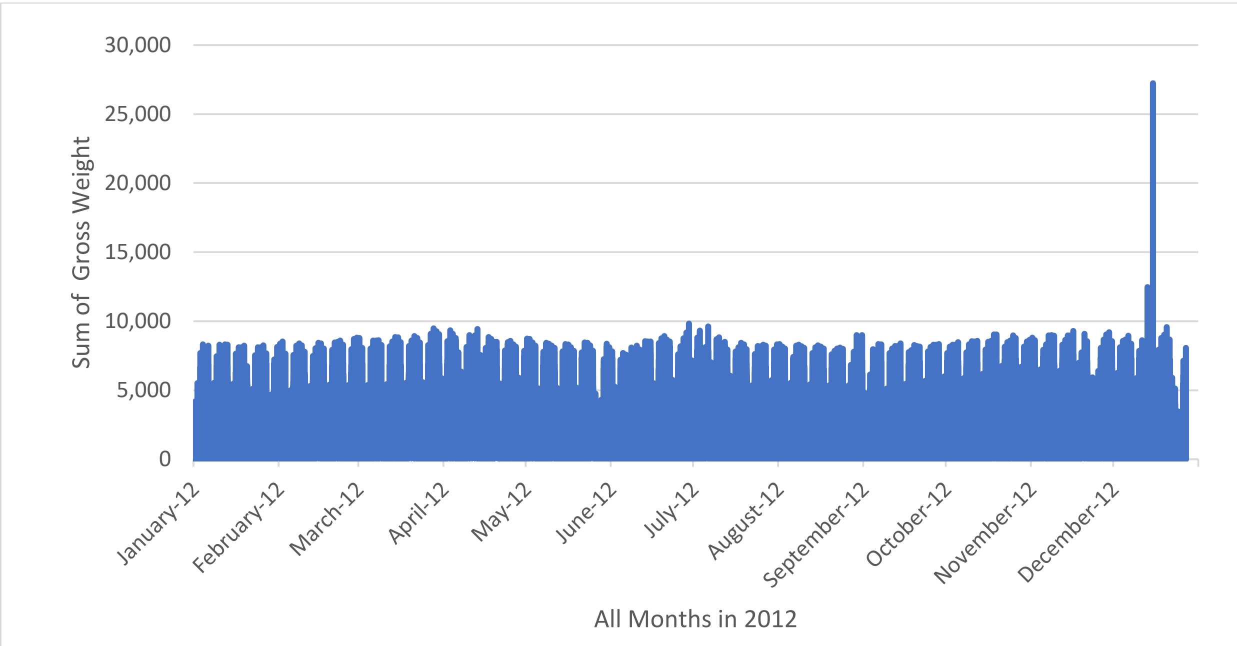


Figure 3-10. Sum of Gross Tonnage by Month in 2012

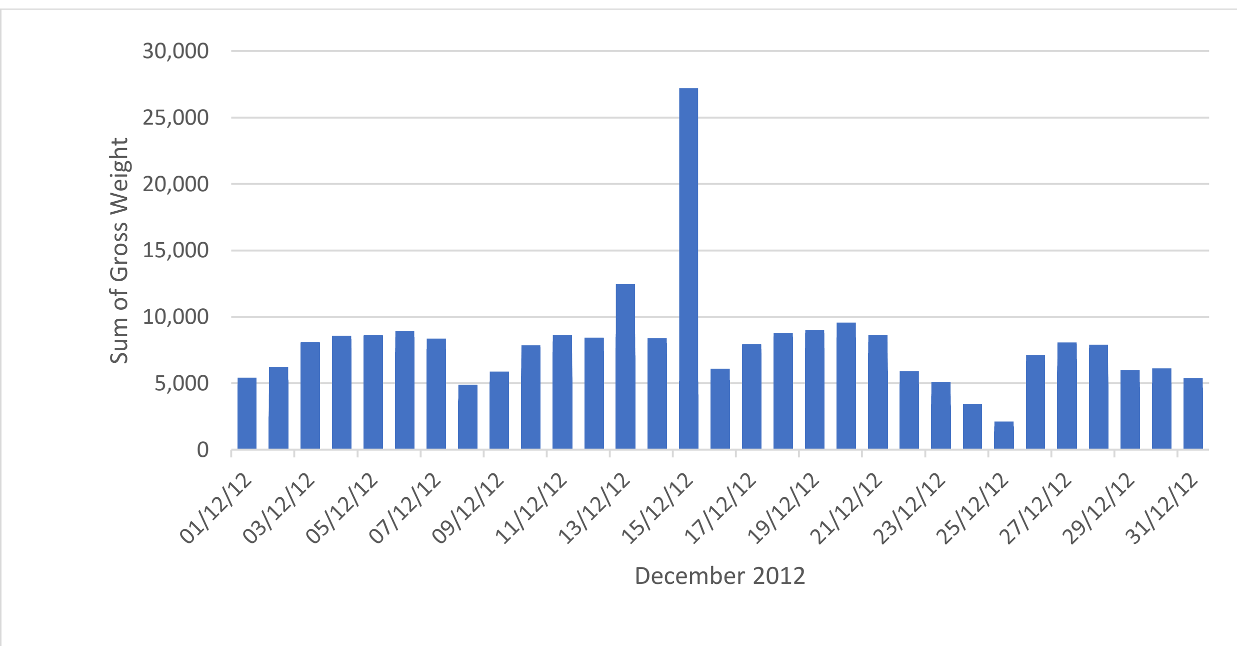


Figure 3-11. Sum of Gross Tonnage by Day in December 2012

3.5 Variation of Site Location

There were 31 WIM sites recorded data in 2012, site 9937, 9926, 9927, 192, 9901, 219, and 9919 were removed after 2012. In 2017, there were 36 sites, and sites 9902, 9925, 9953, 9955, 9956, 9957, 9958, 9959, 9960, 9961, 9962,9963 were added in 2017 compared to 2012 (Figure 3-12).

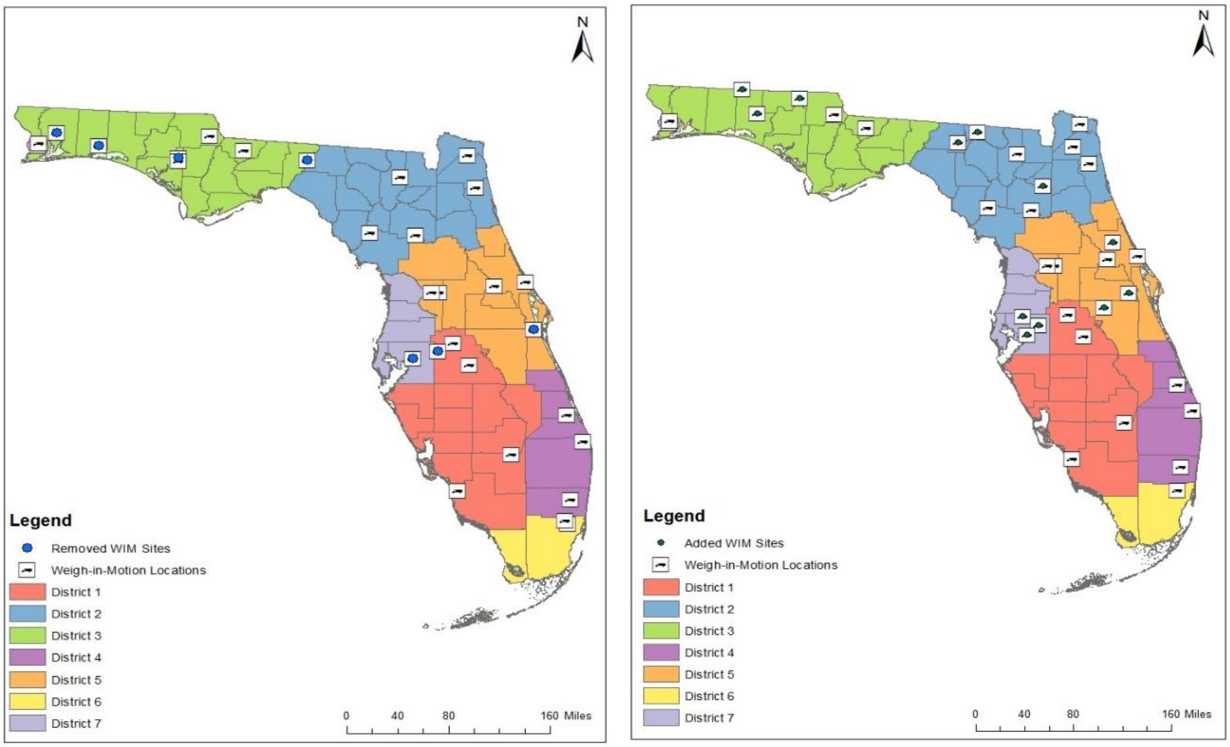


Figure 3-12. Location of WIM Site in 2012 and 2017

3.6 Erroneous Data

The Transportation Data and Analytics (TDA) Office in FDOT collects, stores, analyzes, and reports multiple transportation datasets including, roadway characteristics and traffic data. The continuous traffic monitoring program collects data from TTMS. Sites typically collect volume class and speed while others also collect WIM data. FDOT collects traffic data to submit to the FHWA on an annual basis as required by law (Transportation Data and Analytics Office, 2018).

The TDA Office's Traffic Monitoring Program coordinates the collection of traffic data on all state highways and many highways not on the State Highway System. Traffic data may include daily counts, classification of vehicles, speeds, weight, directional factor, truck factor, and factor of design hours, depending on the location. Each year, traffic data are collected from January to December and then upgraded into annual statistics in the first quarter of the following year.

To properly calculate the truck tonnage for one year, classification data, which are a part of overall TTMS data, are used to annualize the truck tonnage in this study. Also, as some WIM sites are broken for months at a time, classification data as a supplementary can verify the truck volume in WIM data. This dataset contains information of county and site number, direction, type ("A"-Atypical, "B"-Bad, "H"-Holiday, "N"-Normal, "S"-Special event), the volume of each class based on FHWA vehicle classification, and the total volume of all vehicles passing by that specific site. In the computation process of this study, type B data are not taken into the calculation as the Type B data are considered bad data.

During the analysis, a small percentage of truck records with an error was found that contained different types of erroneous data, such as negative load values or lane numbers, erroneous (impossibly large) spacing between two axles, or zero or extremely large axle load values. Because these records only accounted for a very small percentage of the data sample size, they were deleted from the analysis.

Comparing the number of WIM sites between 2012 and 2017, there are 33 sites in 2012 recording data, site 219, 398, 9901, 9926, 9927 and 9937 were removed from the WIM data set. There were 29 sites recording data according to the WIM data set from 2017. Compare the before and after year, the weight data of site 9904, 9906, 9929 from 2016, and site 9960, 9961, 9962 from 2018 were supplemented to the data set of 2017.

4. Methodology

This chapter provides comprehensive information regarding the developed methodology, research steps, and conducted calculation as a case study for years 2012 and 2017. The overall objective of this methodology is to provide a mathematical model based on the most updated available datasets.

The Florida Department of Transportation (FDOT) uses multi-source data sets to calculate the truck tonnage in The FDOT Source Book, namely, Freight Analysis Framework (FAF), Weigh in Motion (WIM), and Annual Average Daily Traffic (AADT). This method combines commodity flow-based and vehicle-based characteristics to present a comprehensive picture. However, as the out-datedness of the FAF data has begun to affect the accuracy of the results derived from the method, this research has been called for to develop a new method that can be easily updated to represent current truck tonnage in the state of Florida and can be more efficiently and accurately utilized for estimating truck tonnage volumes. Through research and analysis, the researchers have found that the WIM-Based method can provide the required modifications to the truck tonnage model that will yield more accurate results.

The methodology of this research consists of three main parts: (i) WIM sites clustering, (ii) Truck Volume Estimation, and (iii) Average Truck Tonnage Calculation. In the WIM-Based methodology, all types of trucks, Class 5 to Class 13 are taken into the calculation based on the WIM dataset. The methodology is outlined in Figure 4-1.

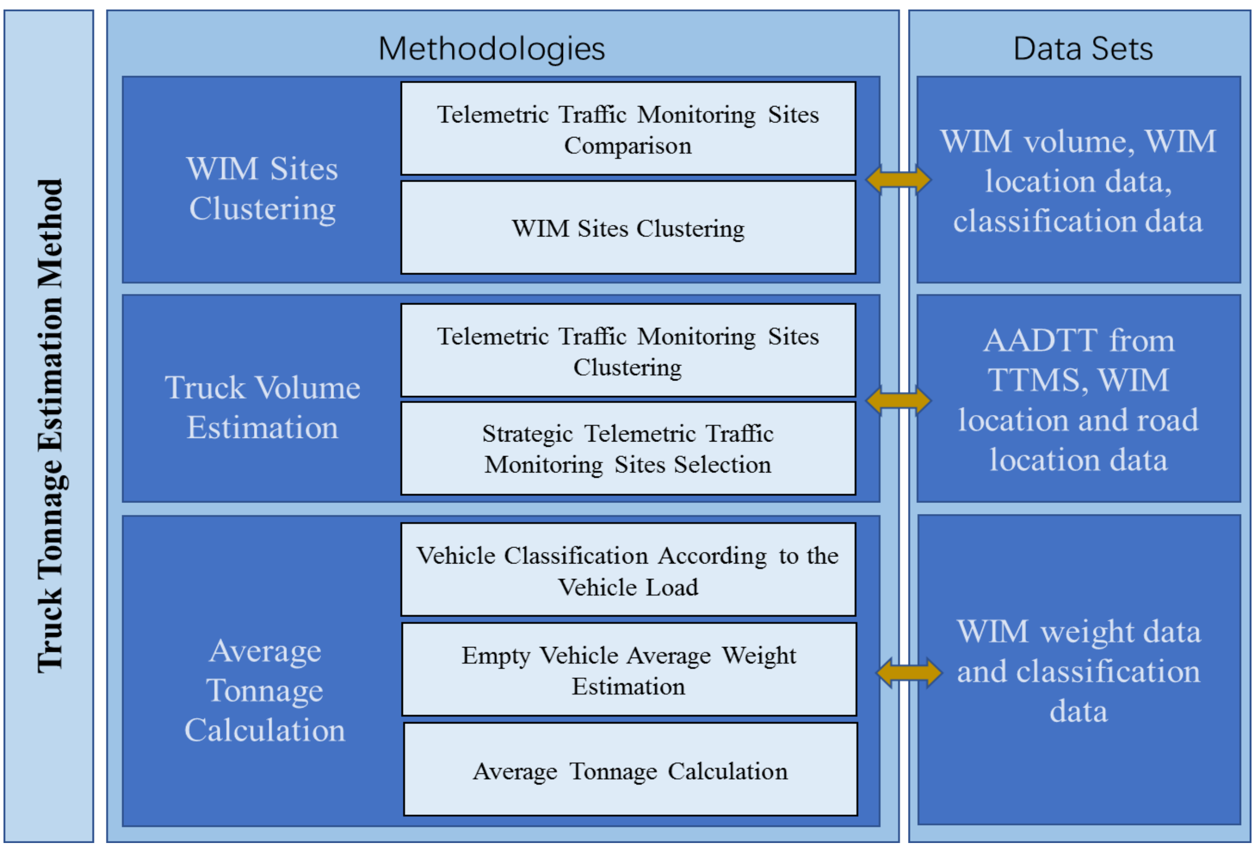


Figure 4-1. Methodology Outline

Before starting the procedure of estimating the average truck tonnage, WIM Sites should be divided into different groups based on the results from average gross tonnage and vehicle volume distributions (Step one). This clustering has been done by applying the K-nearest neighbor's algorithm according to two different variables: (i) truck tonnage distribution and (ii) average truck volume. Then, a clustering classification is fit to the TTMS (Step two). To avoid the double-counting issue, strategic TTMS were selected considering the site location, D factor and T factor (Step three). Afterward, for calculating the average truck tonnage, WIM sites were categorized by a K-mean clustering method based on the vehicle load (Step four), then the empty vehicle weight for different vehicle classes were estimated applying Gaussian distribution of gross tonnage (Step five). At last, a weighted mean method was applied to calculate the average truck tonnage (Step six). The following sections provide detailed descriptions of why and how the methodology is formulated.

4.1 WIM Sites Clustering

Based on the results from gross tonnage and vehicle volume distributions in different WIM sites for all types of trucks, which revealed that Class 9 had the greatest weight and the highest volume among most WIM stations, in this study we used a K-nearest-neighbors algorithm in order to categorize the WIM sites, and the result of WIM sites clustering in 2012 is shown in Figure 4-2. Two factors that were considered in the clustering algorithm were total truck tonnage distribution (the percentage of one truck Class 9) and average truck volume for all types of trucks.

K-nearest-neighbors (KNN) algorithm is one of the most important non-parameter algorithms (Dasarathy , 1991), and it is a supervised learning algorithm. The classification rules are generated by the training samples themselves without any additional data. The KNN classification algorithm predicts the test sample's category according to the K training samples which are the nearest neighbors to the test sample, and judge it to that category which has the largest category probability. The process of the KNN algorithm to classify sample X is referring to the K nearest-neighbor algorithm for text categorization (Jiang, Pang, Wu, & Kuang, 2012).

- Suppose there are j training categories $C_1, C_2, \ldots, C_j$ and the sum of the training samples is N after feature reduction, they become m-dimension feature vector.
- Make sample X to be the same feature vector of the form $(X_1, X_2, \ldots, X_m)$, as all training samples.
- Calculate the similarities between all training samples and X. Taking the i^{th} sample d_i

$(d_{i1}, d_{i2}, \ldots, d_{im})$ as an example, the similarity SIM (X, d_i) is as following:

$$SIM\ (X, d_i) = \frac{\sum_{j=1}^{m} X_j d_{ij}}{\sqrt{\left(\sum_{j=1}^{m} X_j\right)^2}\sqrt{\left(\sum_{j=1}^{m} d_j\right)^2}}$$

- Choose k samples that are larger from N similarities of SIM (X, d_i), (i=1, 2,…, N), and treat them as a KNN collection of X. Then, calculate the probability of X belongs to each category respectively with the following formula.
- $P(X, C_j) = \sum_d \text{SIM}\ (X, d_i) \cdot y(d_i, C_i)$
- Where $y(d_i, C_i)$ is a category attribute function, which satisfied

- $y(d_i, C_i) = \begin{cases} 1, d_i \in C_i \\ 0, d_i \notin C_i \end{cases}$
- Judge sample X to be the category that has the largest $P(X, C_j)$.

According to the clustering results, the WIM sites are clustered into six different groups as follows.

(1) High volume and a high percentage of truck Class 9
(2) High volume and a low percentage of truck Class 9
(3) Median volume and a high percentage of truck Class 9
(4) Median volume and a low percentage of truck Class 9
(5) Low volume and a high percentage of truck Class 9
(6) Low volume and a low percentage of truck Class 9

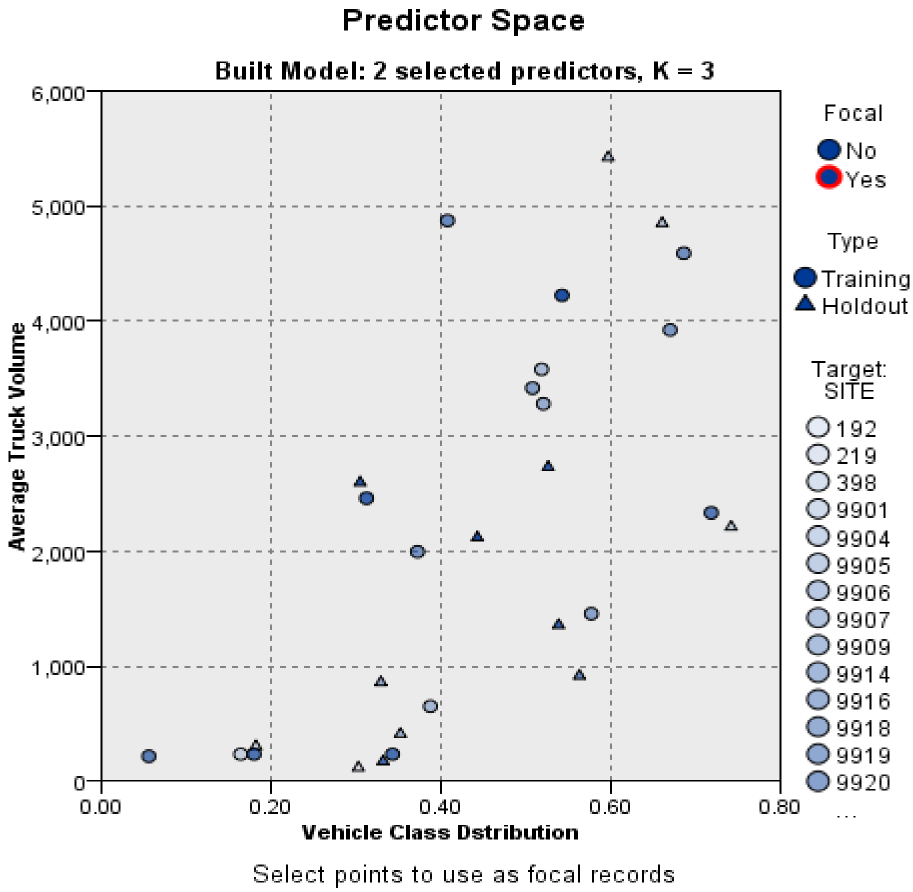


Figure 4-2. KNN of WIM Sites in 2012

4.2 Truck Volume Estimation

4.2.1 Telemetric Traffic Monitoring Sites Clustering

This section describes the process of clustering the TTMS to produce the appropriate category for calculating the average AADT for each category. One of the main tasks involved in clustering TTMS is the selection of the appropriate classifier. To accomplish this task, this study adopted a GIS approach by employing multiple classification steps.

- Mapping the TTMS and WIM stations.
- Classifying WIM sites based on the classification on six different types (explained in previous section)
- Categorizing TTMS sites based on six different WIM sites:
    - Allocating each TTMS to the appropriate WIM site if their centroid is in 20 miles of the WIM locations.
    - Allocating each TTMS to the appropriate WIM site if their centroid is between 20-40 miles of the WIM locations.

Due to the importance of combining both datasets related to TTMS and WIM stations, the TTMS and WIM stations were aggregated and mapped in GIS. Second, the TTMS sites were analyzed based on the results of six classes of WIM sites and then the TTMSs were categorized into six groups. Consequently, each TTMS was allocated to the most appropriate WIM site regarding volume and percentage of truck Class 9. As the next step, all TTMS sites were allocated to the closest WIM station based on the aforementioned description. Figures 4-3 illustrates the results of TTMS clustering for the years 2012 and 2017, respectively.

The clustering processes resulted in the following:

- In 2012, from the total of 353 TTMS, 190 were assigned to WIM sites if their centroid was within 20 miles to the WIM sites; 144 TTMS were assigned to the WIM sites if their centroid was between 20 to 40 miles to the WIM sites; and 19 TTMS residuals were clustered and assigned to the most appropriate WIM location according to their distance.
- In 2017, from the total of 389 TTMS sites, 166 were assigned to WIM sites if their centroid was within 20 miles to the WIM sites, 149 TTMS were assigned to the WIM sites if their centroid was between 20 to 40 miles to the WIM sites, and 74 TTMS residuals were clustered and assigned to the most appropriate WIM location according to their distance.

The results of the TTMS clustering are displayed in Appendix E.

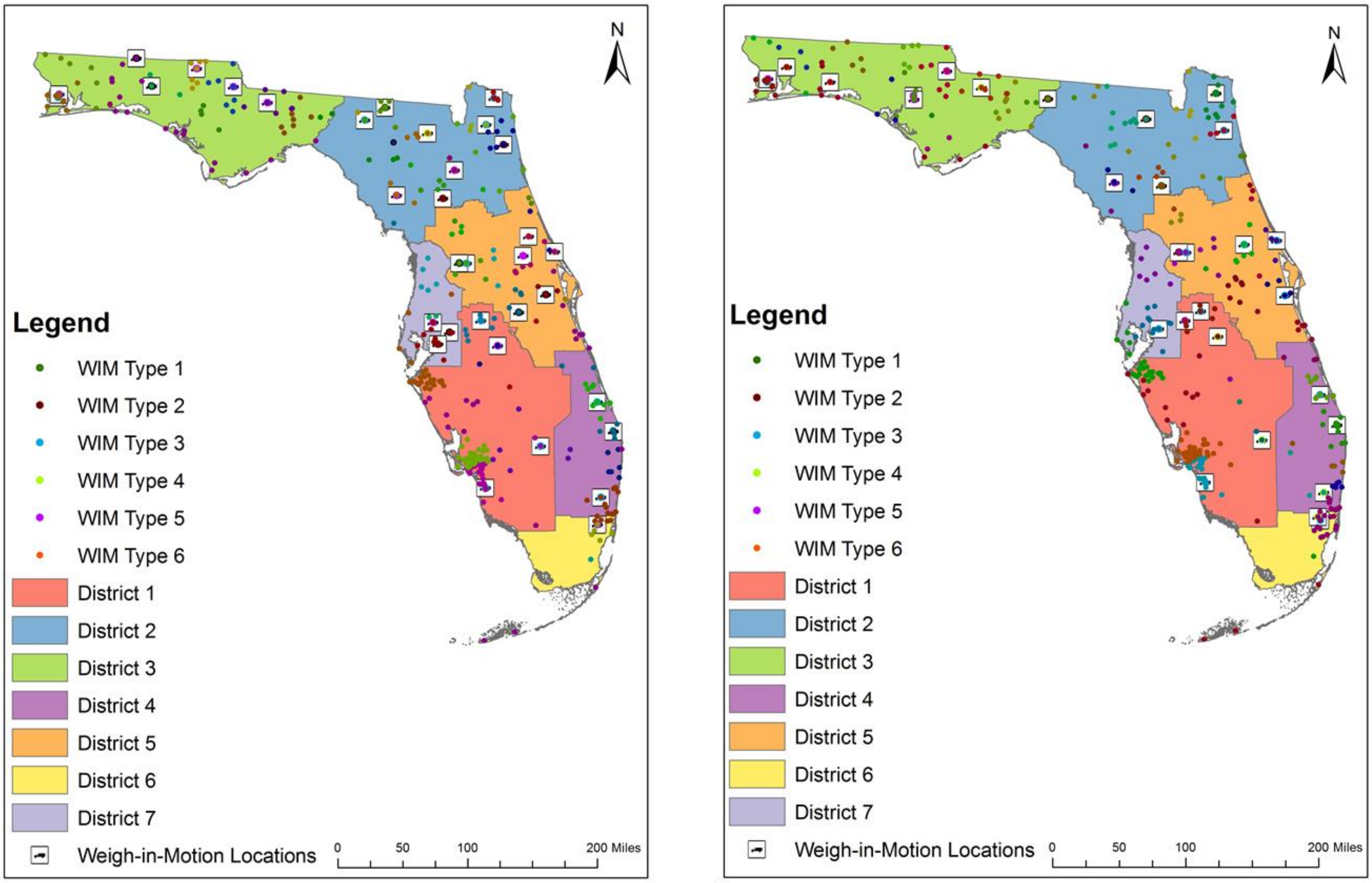


Figure 4-3. Telemetric Traffic Monitoring Sites Clustering

4.2.2 Telemetric Traffic Monitoring Sites Selection

In order to aggregate the total tonnage and avoid the double-counting problem as far as possible, some TTMS sites are selected through the following steps:

Step one Update WIM site information

Step two Develop selection criteria

- Road location
- D factor
- T factor

Step three Strategic site selection according to the road location: If several sites are on the same corridor, and the D factor and T factor are similar, keep the site with large truck volume, remove other sites.

WIM site 9950 is illustrated as a strategic site (the location of the WIM site 9950 is illustrated in Figure 4-4 and marked in yellow). In 2012, 68 sites were assigned to WIM site 9950. As is observed from the figure, site 9950 is surrounded by a dense volume of TTMS (Figure 4-5 indicates the situation more in detail). In order to avoid the multiple counting issue, after considering the site location, D factor and T factor were reflected. 34 TTMS were deleted, which accounted for 44% of the total number of TTMS, and it resulted in a 47% reduction in the total volume assigned to the WIM site 9950. We assume the same percentage of double-counting for the other WIM sites as well.

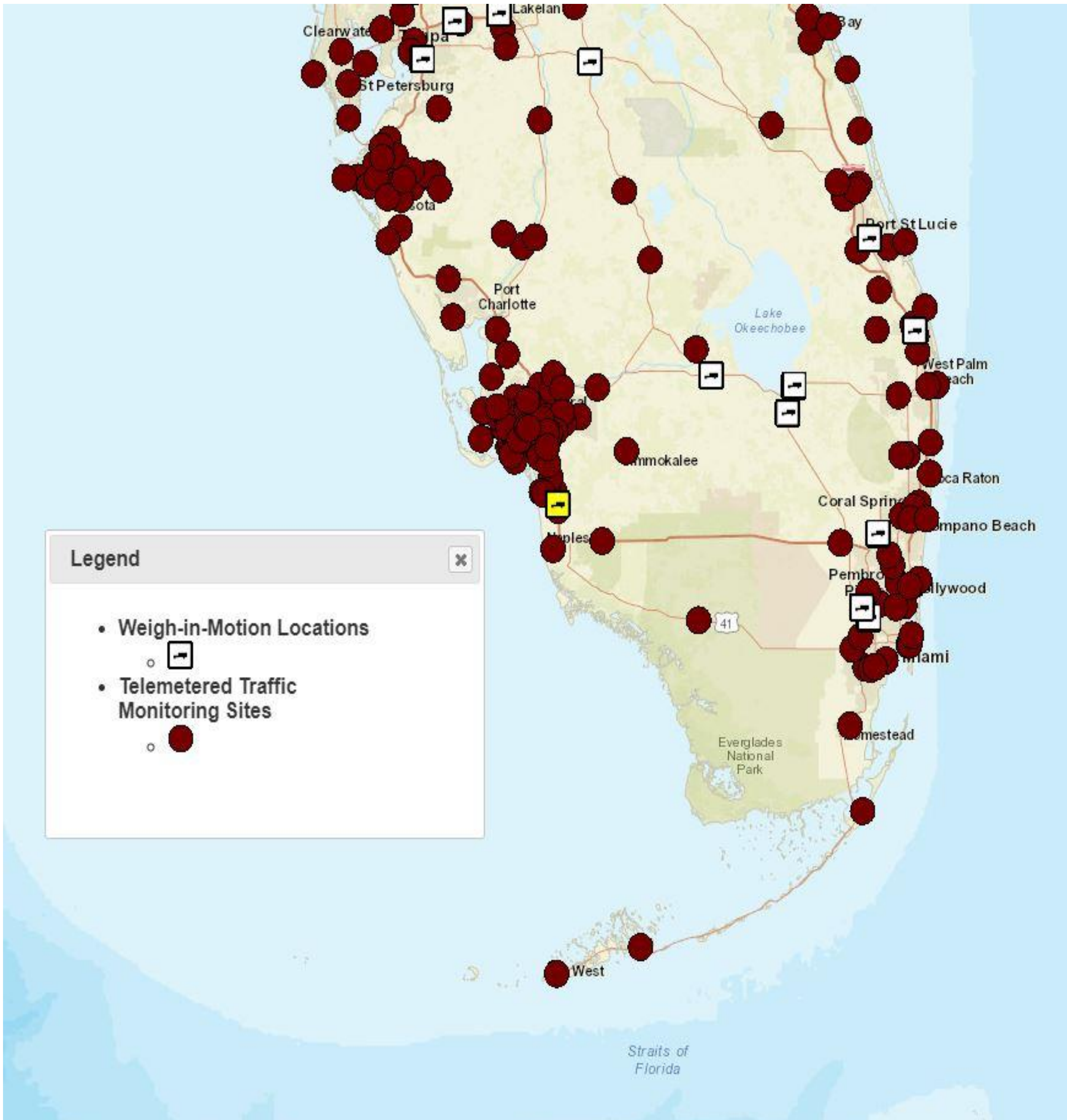


Figure 4-4. Critical Location of WIM site 9950

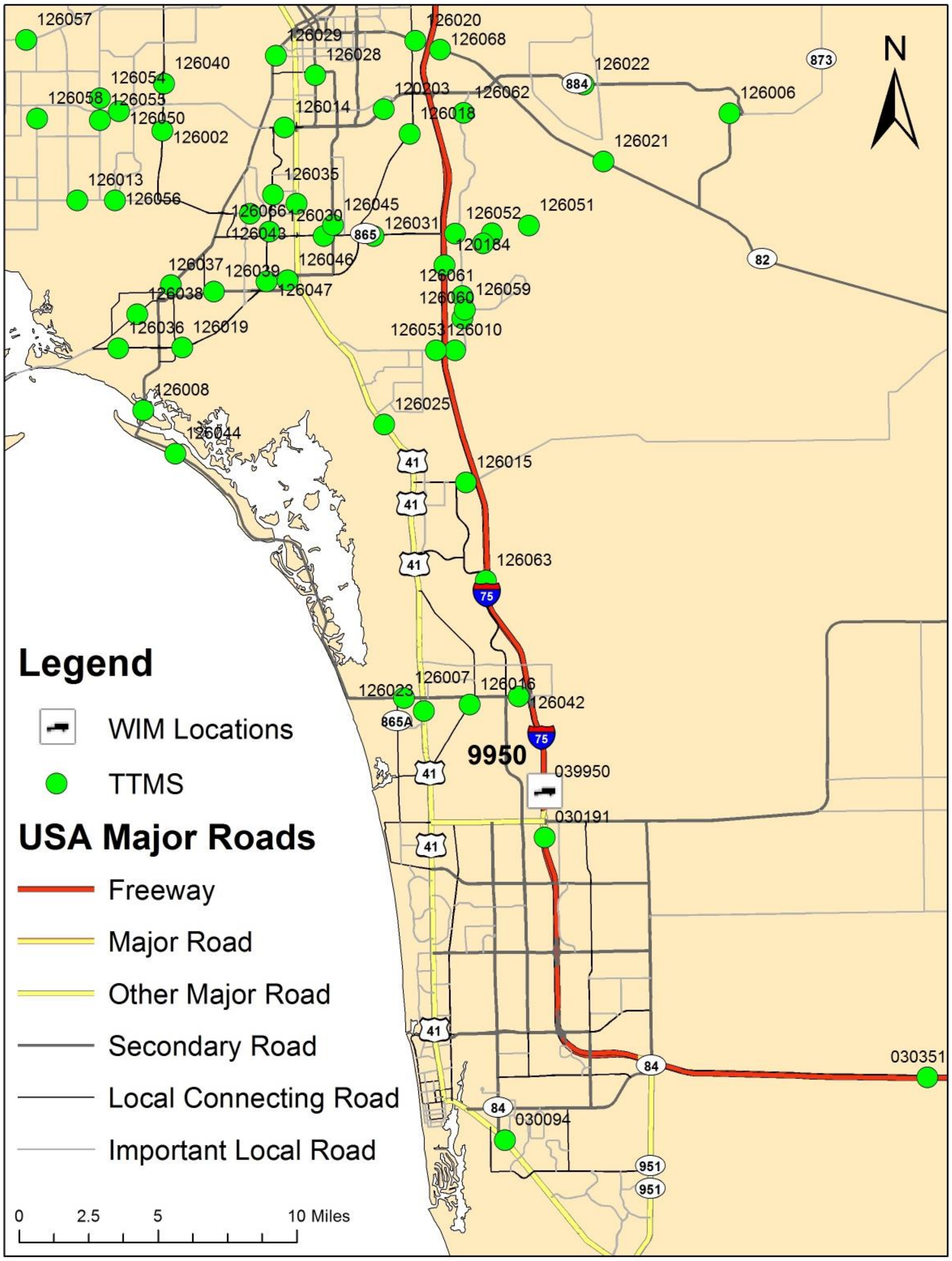


Figure 4-5. Road Location of TTMS

4.3. Truck Average Tonnage Calculation

The procedure of truck average tonnage calculation involved a proposed K-Means clustering to categorize the vehicle load, the empty vehicle average weight estimation applying Gaussian distribution of gross tonnage, results from TTMS clustering, and a weighted mean method. The following sections provide detailed descriptions of how the methodology is formulated.

4.3.1 K-Means Clustering for Determining Vehicle Load

In order to reflect the load type of each vehicle, each class of trucks is divided into three different categories: empty, half load, and full load. The K-Means clustering method has been used. K-Means clustering is one of the simplest and popular unsupervised machine learning algorithms. Typically, unsupervised algorithms use only input vectors to create inferences from datasets without referring to known, or labeled, outcomes.

The goal of this algorithm is to find groups in the vehicle weight data, with the number of groups represented by the variable K. The algorithm works iteratively to assign each weight data point to one of K groups based on their weight distribution. Data points are clustered based on feature similarity. The results of the K-means clustering algorithm are the centroids of the K clusters, which can be used to label new data for the training data (each data point is assigned to a single cluster).

The algorithms start with initial estimates for the K centroids, which can either be randomly generated or randomly selected from the data set. The algorithm then iterates between three steps (see Figure 4-5). The calculation steps are as follows:

- **Step one:** Initialization

The first thing k-means does is to randomly choose K examples from the dataset as initial centroids simply because it does not know yet where the center of each cluster is.

- **Step two:** Cluster assignment

Each centroid defines one of the clusters. In this step, each data point is assigned to its nearest centroid, based on the squared Euclidean distance. More formally, given a set of observations $(x_1, x_2 \ldots, x_n)$, K-means clustering aims to partition the n observation into K (K$\leq n$) sets S=$\{S_1, S_2, \ldots, S_k\}$ to minimize the within-cluster sum of squares. The objective is to find:

$$\underset{S}{\arg\min} \sum_{i=1}^{K} \sum\nolimits_{n \in S_i} |x_n - \mu_i|^2$$

Where, *n*: Number of the whole data

x_n*:* The n^{th} observations

K: The group number of the data

S_i: Subset of the data, i =1,…, K

μ_j: Geometric centroid of the data points in S_i

➢ **Step three:** Centroid update

In this step, the centroids are recomputed. This is done by taking the mean of all data points assigned to that centroid's cluster.

The algorithm iterates between steps two and three until a stopping criterion is met (i.e., no data points change clusters, the sum of the distances is minimized, or some maximum number of iterations is reached).

This algorithm is guaranteed to converge to a result. The result may be a local optimum (i.e., not necessarily the best possible outcome), meaning that assessing more than one run of the algorithm with randomized starting centroids may give a better outcome.

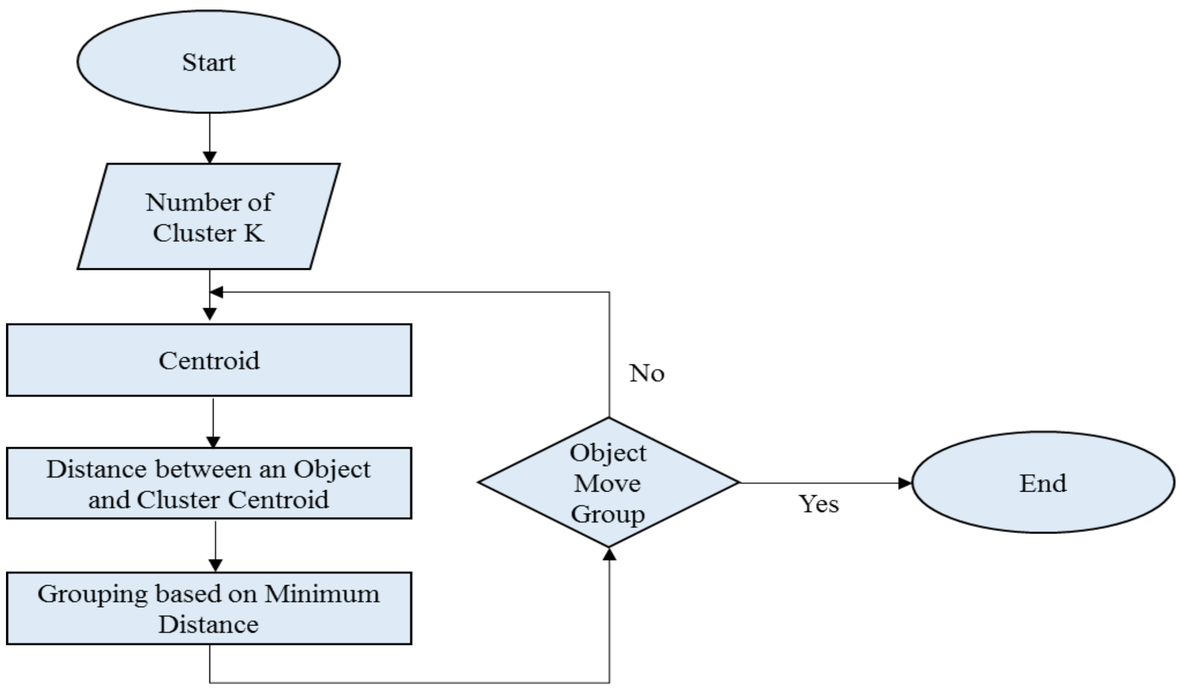


Figure 4-6. K-Mean Clustering Method

After categorizing all WIM data in 2012, we define the truckload type (empty, half-load, and full-load) according to the clustering results, the flowchart is shown in Figure 4-6. Figures 4-7 and 4-8 are the clustering results of different vehicle classes in WIM site 9918. It can be seen that the truck volume of the half-load is more than the volume of the empty and full-load truck. According to the clustering results, the average truck tonnage can be calculated considering the load type.

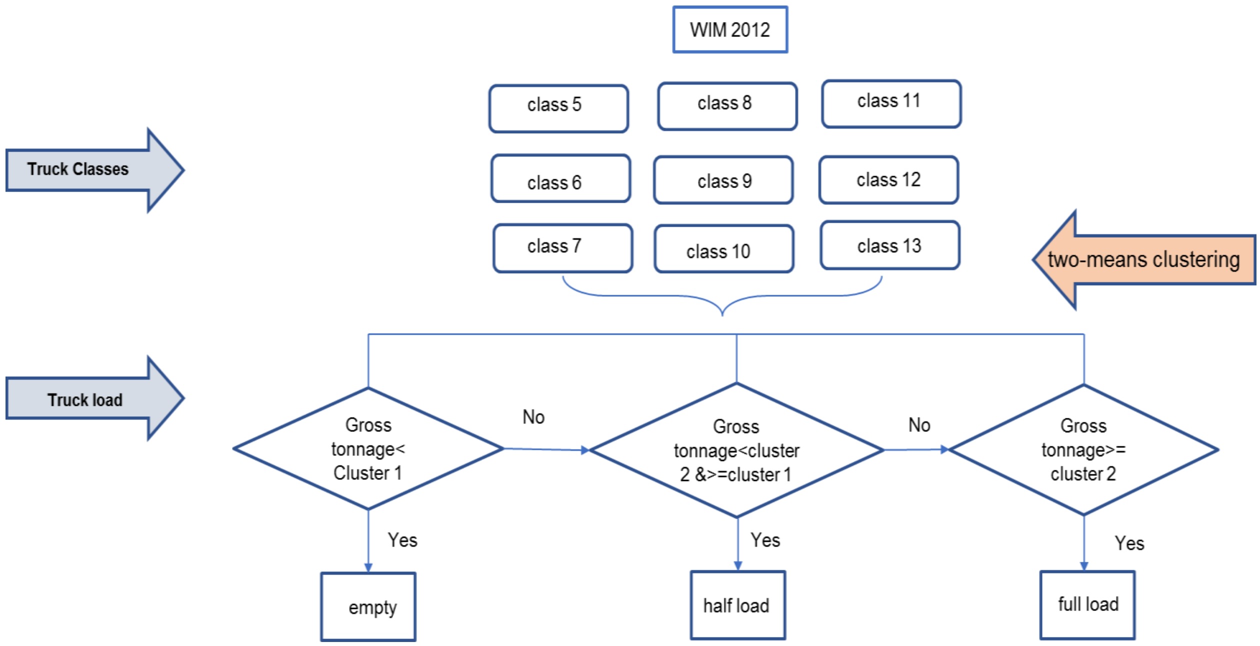


Figure 4-7. WIM Data Clustering

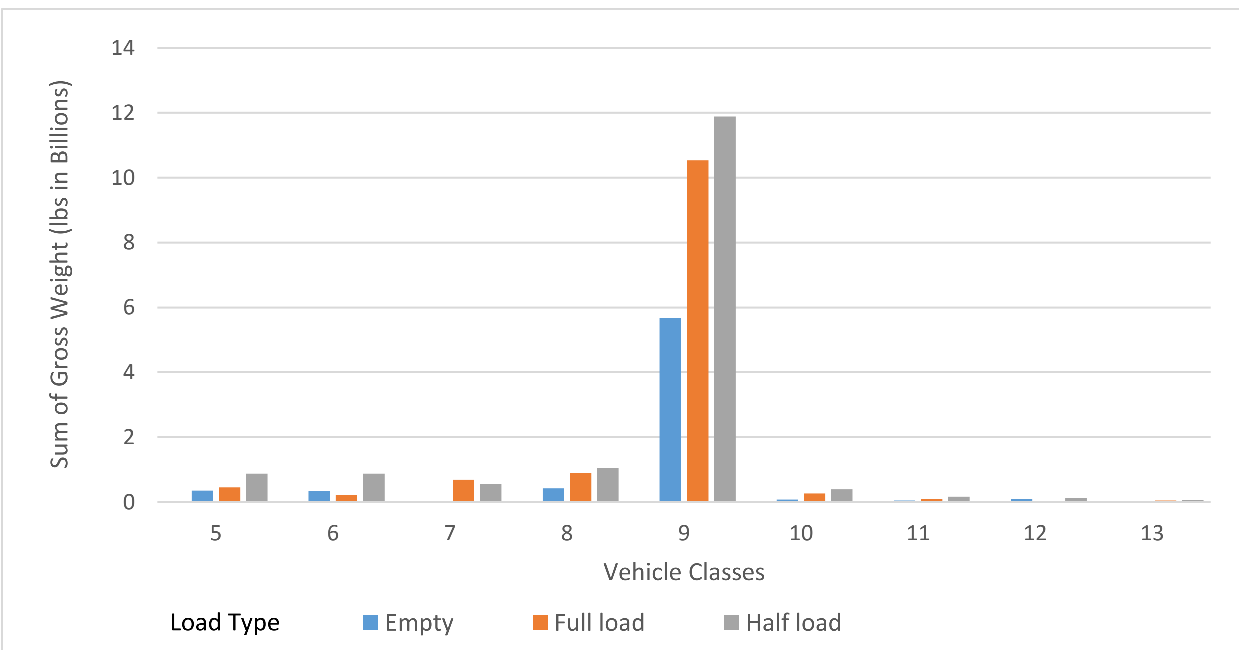


Figure 4-8. Sum of Gross Tonnage by Load Type for Different Vehicle Class in Site 9918

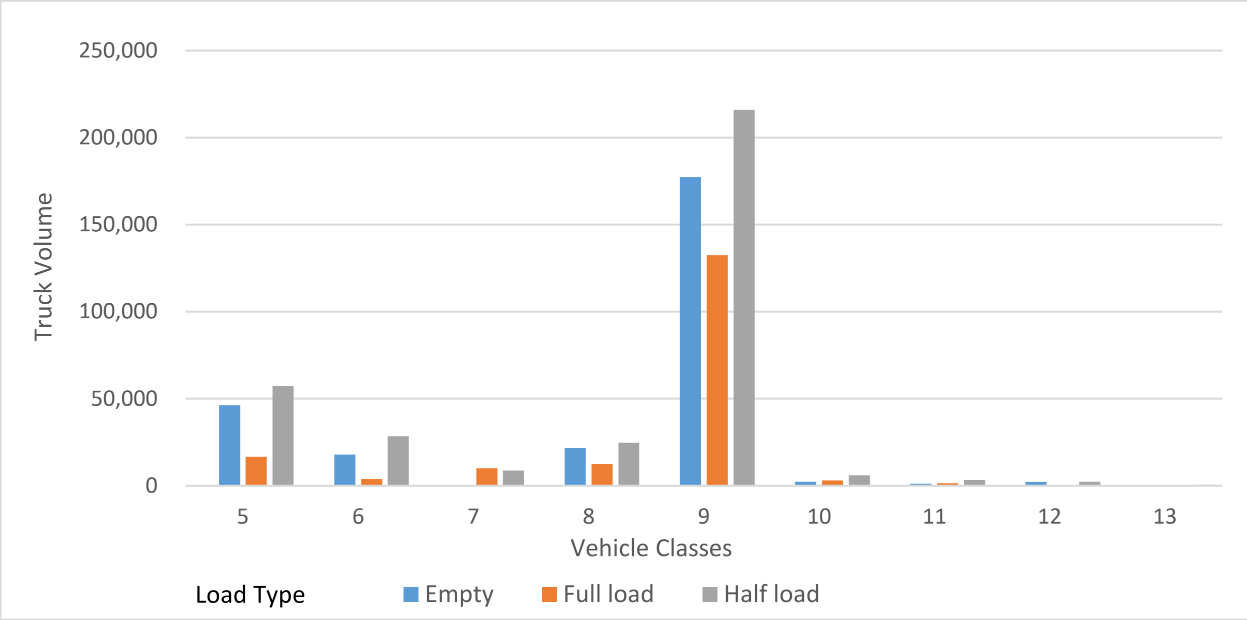
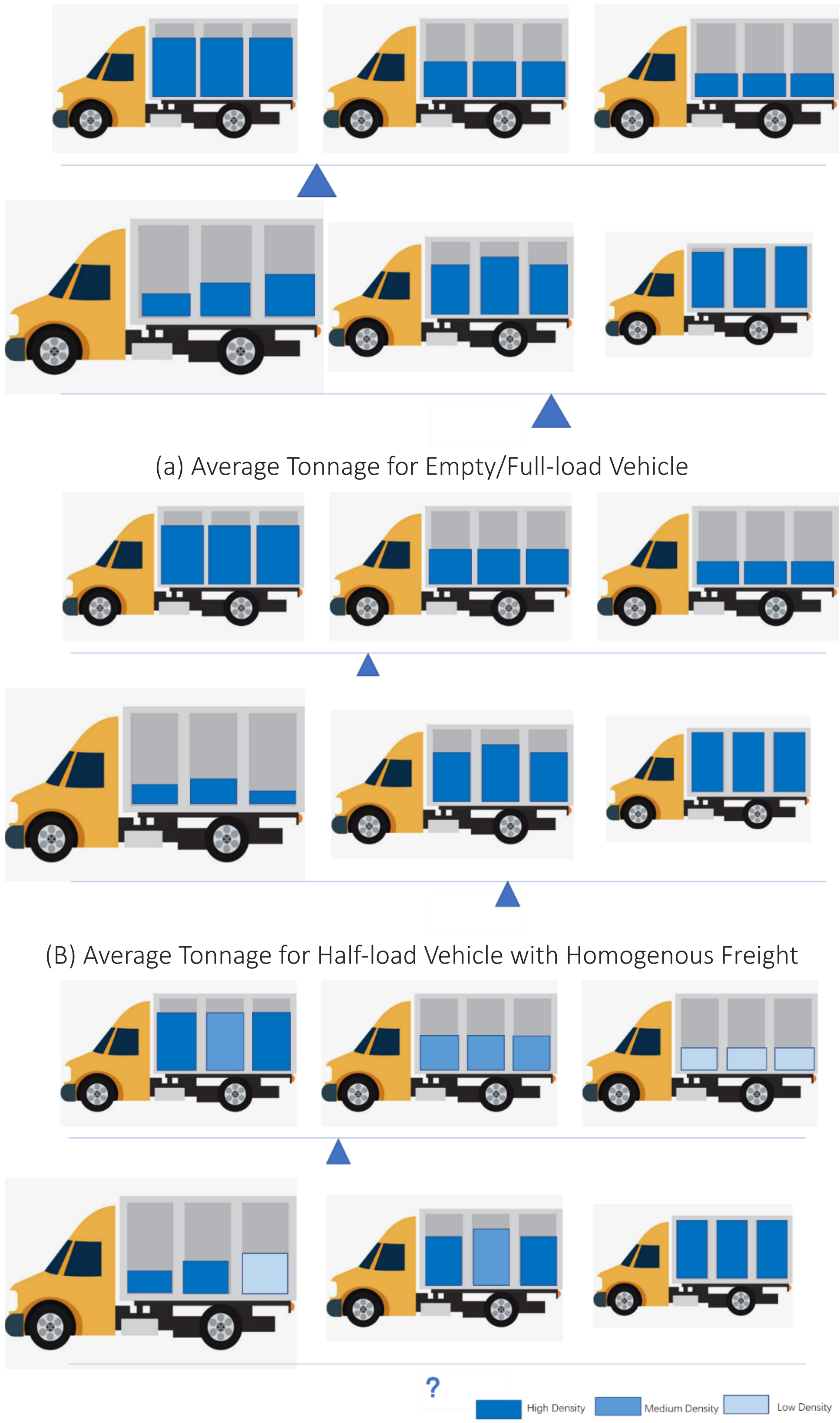


Figure 4-9. Truck Volume by Load Type for Different Vehicle Class in Site 9918

Tables 4-1 and 4-2 provide K-mean clustering results of vehicle classes 5 and 9. After ten iterations, the final clustering center is located at sites (9790, 22123) and (36663, 73724), respectively.

4.3.2 Adjusted Weighted Average Tonnage Calculation for Vehicle Class

Considering the load type of the vehicle (empty, half-load, and full-load), the average tonnage will have a big difference, which can be seen from Figures 4-9 (a), (b), and (c). If the freight is homogenous, the average tonnage is depended on the freight volume. If the freight is heterogeneously distributed, the central point can change. That is to say, when some values get more weight than others, the central point (the mean) can change. The adjusted weighted factor is introduced to reflect the heterogeneity.



(a) Average Tonnage for Empty/Full-load Vehicle

(B) Average Tonnage for Half-load Vehicle with Homogenous Freight

(C) Average Tonnage for Half-load Vehicle with Heterogeneous Freight

Figure 4-10. Adjusted Weighted Average Method

Table 4-1. K-Mean Clustering of Truck Gross Tonnage – Vehicle Class 5

Iteration History		
Iteration	Change in Cluster Centers	
	1	2
1	9312.996	30503.17
2	247.03	16089.19
3	970.469	7130.17
4	1059.421	3672.401
5	811.662	1979.296
6	507.992	1053.65
7	289.784	572.288
8	163.089	313.186
9	82.332	156.776
10	40.423	77.052
Initial Cluster Centers		
GROSS_WT (lbs)	Cluster	
	1	2
	4670	83710
Final Cluster Centers		
GROSS_WT (lbs)	Cluster	
	1	2
	9790	22123

Table 4-2. K-Mean Clustering of Truck Gross Tonnage – Vehicle Class 9

Iteration History		
Iteration	Change in Cluster Centers	
	1	2
1	32072.535	55121.129
2	5769.27	3717.823
3	1325.205	1313.451
4	348.879	400.451
5	96.698	115.345
6	29.799	35.94
7	7.79	9.426
8	2.188	2.65
9	0	0
Initial Cluster Centers		
GROSS_WT (lbs)	Cluster	
	1	2
	12170	134440
Final Cluster Centers		
GROSS_WT (lbs)	Cluster	
	1	2
	36663	73724

Adjusted weighted average tonnage for class 5=

{(average empty tonnage   count number of empty   tonnage percentage of empty for class 5 / count number percentage of empty for class 5)

+ (average full-load tonnage   count number of full-load   tonnage percentage of full-load for class 5/count number percentage of full-load for class 5)

+ (average half-load tonnage   count number of half-load   tonnage percentage of half-load for class 5 / count number percentage of half-load for class 5)}

/ (count number of empty   tonnage percentage of empty for class 5 / count number percentage of empty for class 5

+ count number of full-load   tonnage percentage of full-load for class 5 / count number percentage of full-load for class 5

+ count number of half-load tonnage percentage of half-load for class 5 / count number percentage of half-load for class 5)

4.3.3 Average Annual Truck Traffic Calculation for Each Site

A weighted average is most often computed concerning the frequency of the values in a data set. One can calculate a weighted average in different ways. However, certain values in a data set are given more importance for reasons other than frequency of occurrence. Each data point value is multiplied by the assigned weight, which is then summed and divided by the number of data points. A weighted average is extremely useful in that it allows the final average number to reflect the relative importance of each observation and is thus more descriptive than a simple average. It also has the effect of smoothing out data, thereby enhancing accuracy.

The weighted average tonnage for site k ($\overline{x_{s_k}}$) is equal to the sum of the truck volume (w_i) times the average tonnage for each vehicle class (x_i) divided by the sum of the volume:

$$\overline{x_{s_k}} = \frac{\sum_{i=5}^{13} w_i \cdot x_i}{\sum_{i=5}^{13} w_i} = \frac{w_5 x_5 + w_6 x_6 + \cdots + w_{13} x_{13}}{w_5 + w_6 + \cdots + w_{13}}$$

4.3.4 Empty Vehicle Average Weight Estimation

In order to exclude the weights of empty trucks from the total gross tonnage and calculate the net tonnage of commodities, the weights of empty trucks were gathered from different sources, and some estimation and assumptions were made to accomplish this step. For trucks of Classes 5-8, the empty vehicle weights are estimated according to the Gaussian distribution of gross tonnage, and the vehicle weight classes and categories from the U.S. Department of Energy. For Class 9-13 trucks, the empty vehicle weights are estimated according to the empty vehicle weight estimation (FHWA, 2001), Gaussian distribution of gross tonnage from WIM data (Appendix B), and the percentage of empty vehicle weight estimation (Transportation Data and Analytics Office, 2018). The estimation result is in Appendix D for reference.

4.4 Truck Tonnage Calculation

Truck tonnage estimation has been taken into account for trucks ranged from Class 5 to Class 13. We aggregate the average tonnage and the annual traffic volume in selected sites to calculate the truck tonnage:

$$T=\sum_{k=1}^{n} \overline{x_{s_k}} v_k \qquad k=1\ldots n,\ s_k=1,\ \ldots\ m$$

Where, k WIM site

s_k WIM site group

$\overline{x_{s_k}}$ Average tonnage for WIM site group s_k

v_k Truck volume assigned to the WIM site k

The aforementioned methodology is being used for truck tonnage estimation in Florida through the aggregation of truck volume and average tonnage for each site in 2012 and 2017.The calculation results for both WIM-Based and FAF-Based are shown in Table 4-3.

Table 4-3. Freight Tonnage Estimation Results

Method	Vehicle Class	2012	2017	Increase Percentage
WIM-Based	All classes of the trucks	1,112,985,627	1,376,125,766	23.64
	Combination trucks	712,310,801	950,902,904	33.50
FAF-Based	Combination trucks	580,000,000	770,000,000	32.76

The freight tonnage of combination trucks using the WIM-Based method is around 710 million tons in 2012 and 950 million tons in 2017, which is larger than the approximate value reported by the FAF-Based method. The freight tonnage of combination trucks accounts for 66.5% of the total tonnage for the WIM-Based method after the data fusion of WIM weight data and TTMS volume data.

The current FDOT formula considers only the combination trucks (Classes 8-13), while the proposed methodology also considers trucks in Classes 5-7 since they are transferring a considerable amount of truck volume, especially for truck movements within the state. The proposed methodology captures more freight tonnages and employs up-to-date data.

Meanwhile, shipments from some industries, like transportation, construction, petroleum and natural gas extraction, municipal solid waste, logging, as well as household and business moves are not covered by the CFS. The proposed methodology uses vehicle-based data, which can capture all the freight types.

5. Method Evaluation

This chapter presents methods evaluation for the FAF-Based method and WIM-Based method considering four criterions: data availability, data matching, calculation accuracy, and calculation time (Table 5-1).

Table 5-1. Comparison of FAF-Based Method and WIM-Based Method

Criterion	Method	Description
Data Availability	FAF-Based	The FAF dataset is based primarily on the CFS. The CFS is a shipper-based survey. FAF presents tonnage and value estimates by commodity types, modes, and origins and destinations. It is reported every five years
	WIM-Based	TTMS data is updated each year
Data Matching	FAF-Based	Investigation data (Commodity-based data): The volumes and sources of traffic passing through their jurisdictions at the corridor level, but not intra-county movements, not all classes of trucks (excluding Classes 5-7), not all types of commodities.
	WIM-Based	Real time loop data (Vehicle-based data): All truck types and weight, classification data, and truck volume data from TTMS; empty vehicle weight extracted.
Calculation Accuracy	FAF-Based	FAF-Based tonnage data is interpolated using combination truck miles traveled (CTMT) data and Weigh in Motion Data to calculate truck tonnage. However, the calibration of the adjust factor is needed. The detailed information of the freight movement cannot be reflected.
	WIM-Based	WIM-Based tonnage is integrated using the average tonnage of each WIM site and the total truck volume from TTMS. Also the truck class distribution and weight of each WIM site are analyzed. Double counting problem is eliminated as much as possible.
Calculation Time	FAF-Based	It is much easier to have a quick result.
	WIM-Based	More observation and calculation are needed.

5.1 FAF-Based Method

FDOT's current truck tonnage formula applies tonnage derived from FAF4 with 2012 tonnage and the average load of full combination trucks and combination truck miles traveled. FAF presents tonnage and value estimates by commodity types, modes, and origins and destinations. It is reported every five years.

The FAF provides a comprehensive national picture of freight flows, trends, and a baseline forecast to support policy studies. The FAF informs states and localities about their major trading partners and the volumes and sources of traffic passing through their jurisdictions at the corridor level. The FAF does not provide local detail or temporal (seasonal, daily, or hourly) variation in freight flows that are typically necessary to support project planning. While statistical methods exist that allow analysts to disaggregate FAF data from FAF regions to counties or smaller areas, FHWA has not measured any of these methods to establish estimates of reliability or accuracy. FAF estimates of truck tonnage and the number of trucks on the network, particularly in regions with multiple routes or significant local traffic between major centers of freight activity, should be supplemented with local data to support local applications. The current FDOT formula is considering only combination trucks (Classes 8-13), while trucks in Classes 5-7 are transporting a considerable amount of the volume, especially for truck movement within the state. As is observed from the facts and figures we mentioned before (Figure 3-3), Class 5-7 trucks account for a large percentage of the total tonnage, around 13%, which is usually urban freight movements.

FAF-Based tonnage data is interpolated using combination truck miles traveled (CTMT) data and Weigh in Motion data to calculate truck tonnage. However, the calibration of the adjustment factor is needed. The detailed information about the freight movement cannot be reflected.

5.2 WIM-Based Method

The real-time WIM data is used to capture the tonnage variation of the whole state of Florida, which is updated each year. All the truck classes (5-13) are considered in the methodology proposed in this research. As the empty vehicle weight needs to be removed from the gross tonnage, we calculated empty vehicle weight estimation according to the Gaussian probability distribution of gross tonnage and other relevant reports. Next, K-mean clustering and adjusted weight method were used to calculate the average tonnage, to reflect different load type of each vehicle. WIM-Based tonnage is integrated using the average tonnage of each WIM site and the total truck volume from TTMS. In addition, the truck class distribution and weight of each WIM site are analyzed. The double-counting issue is eliminated as much as possible. In this way, the truck tonnage can be reported each year with annually updated data. However, compared with the FAF-Based method, this method is more rigorous. More data analysis and processing are needed.

6. Conclusions

A truck tonnage estimation methodology is proposed to address the need for freight mobility evaluation and freight transportation planning. A supervised machine clustering method was proposed to categorize the WIM sites based on the vehicle class distribution of gross tonnage and truck volume. Based on the clustering, TTMSs were grouped according to the site location and the truck volume. To avoid double counting of the truck volume, TTMSs were selected considering the road location, D factor and T factor. A weighted mean method was developed to calculate the average truck tonnage. Besides, the empty vehicle weight for different vehicle classes is estimated applying Gaussian distribution of gross tonnage and is eliminated from the calculation. Finally, a truck freight tonnage estimation formula is formulated, which integrated the truck volume and average truck freight tonnage for each WIM site.

Compared with FDOT's existing truck tonnage estimation method, the method in this paper allows truck tonnage to be estimated with updated data from WIM and AADTT reported weekly and annually, respectively. Moreover, the proposed methodology can be used to reflect all the volume changes within all truck classes (Classes 5-13) in different locations comprehensively, which can provide estimation for the statewide performance evaluation of freight mobility.

Truck tonnage is needed for a wide range of applications including but not limited to pavement design, weight enforcement, traffic monitoring, and freight transportation planning. Unfortunately, the low spatial resolution of weight sensors along the transportation network can limit these and other potential applications. For future research, truck travel patterns derived from a large truck global positioning system (GPS) database can be used to determine the degree to which a WIM site and a traffic count site are spatially related. With this information, truck trip data generated from GPS can be combined with WIM location data to avoid double counting. Another refinement would improve the method by investigating the correlation among the vehicle class, land use, and road type.

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APPENDIX A. WIM Description

Table A-1. WIM Description

Field	Description	Data Type
FILETYPE	Record Type	VARCHAR2
COUNTY	Federal Information Processing Standards (FIPS) Code for County	Number
SITE	Site ID	Number
UNITNO	Unit Number - 1 for single-unit site, 2 for dual-unit site (multiple units required at one location because of number of lanes or logistics for running conduit/cabling)	Number
DIR	Direction of Travel	VARCHAR2
LANE	Lane number of travel – Lane 1 begins in the outside lane, when heading North or East and increment from there.	Number
BEGDATE	Date stamp (mm/dd/yyyy)	VARCHAR2
TIME_INTERVAL	Time stamp	Number
VEHNO	Vehicle Number – generated by the system beginning at midnight with 1, up to approximately 65,500 and it resets to 1 again until midnight and it resets again	Number
SCHEME F_CODE	Vehicle Class (Scheme "F") Code	Number
VEHTYP	Vehicle Type	Number
VOL_CODE	Violation Code - Speed, Overweight, etc.	Number
SPD	Speed of Vehicle (in mph)	Number
VEH_LENGTH	Length of Vehicle (in feet) From Bumper to Bumper (format 99.99 decimal implied)	Number
GROSS_WT	Gross Weight of Vehicle (in lbs)	Number
LEFTWGT1	Left Axle 1 Weight (in lbs)	Number
RIGHTWGT1	Right Axle 1 Weight (in lbs)	Number
AXLEWGT1	Axle Weight 1 (in lbs)	Number
LEFTWGT2	Left Axle 2 Weight (in lbs)	Number
RIGHTWGT2	Right Axle 2 Weight (in lbs)	Number
AXLEWGT2	Axle Weight 2 (in lbs)	Number

…	…	…
LEFTWGT9	Left Axle 9 Weight (in lbs)	Number
RIGHTWGT9	Right Axle 9 Weight (in lbs)	Number
AXLEWGT9	Axle Weight 9 (in lbs)	Number
NUM_AXLE_SP	Number of Axle Spaces	Number
NUM_AXLES	Number of Axles	Number
WHEELBASE	Wheel base (in feet) – distance from first to last axle (format 99.99 decimal implied)	Number
SPACING1	Axle 1-2 Spacing (in feet) (format 99.99 decimal implied)	Number
SPACING2	Axle 2-3 Spacing (in feet) (format 99.99 decimal implied)	Number
…	…	…
SPACING6	Axle 6-7 Spacing (in feet) (format 99.99 decimal implied)	Number
SPACING7	Axle 7-8 Spacing (in feet) (format 99.99 decimal implied)	Number
SPACING8	Axle 8-9 Spacing (in feet) (format 99.99 decimal implied)	Number
TYPE	E = Error and N = Normal	VARCHAR
ERRMSG	Error Message	VARCHAR

APPENDIX B. Distribution of Truck Tonnage Weight by Frequency

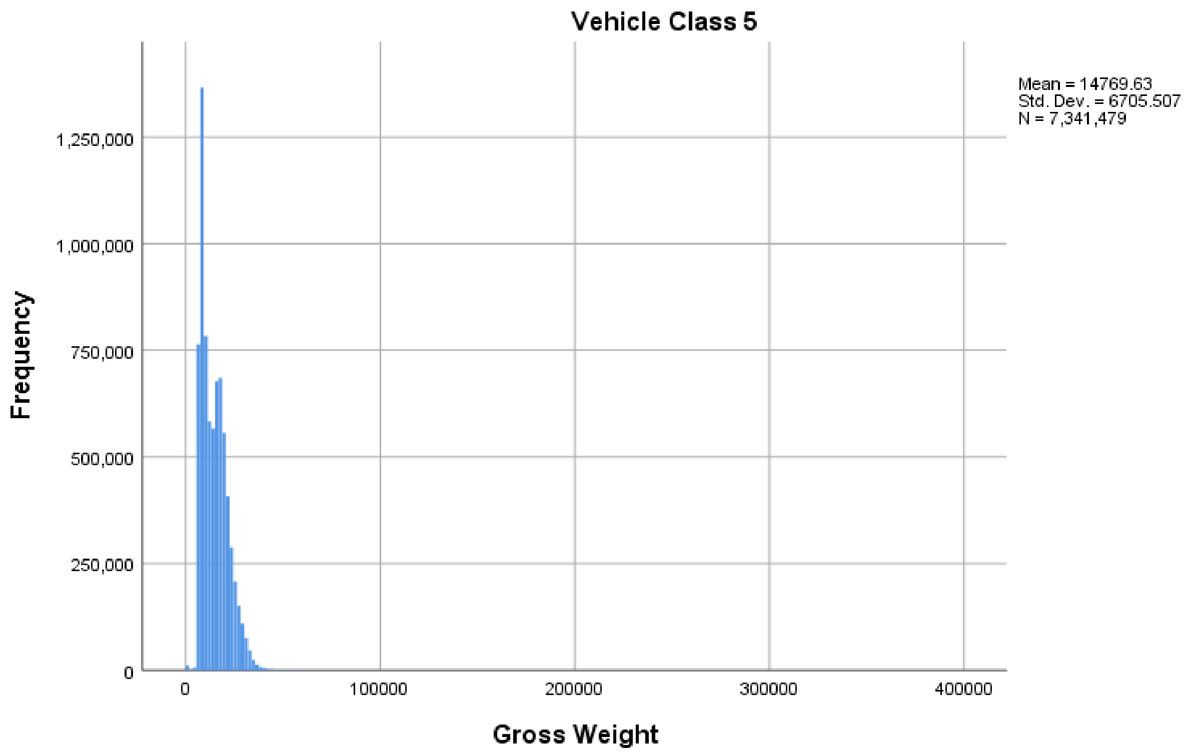

Figure B-1. Vehicle Class 5

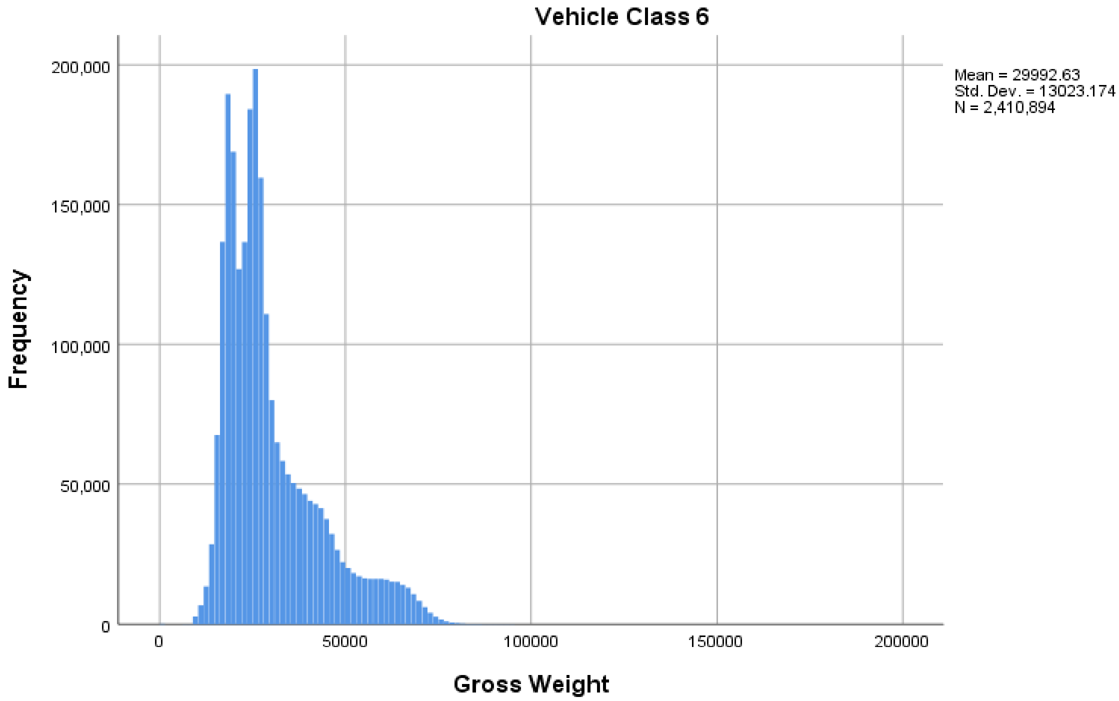

Figure B-2. Vehicle Class 6

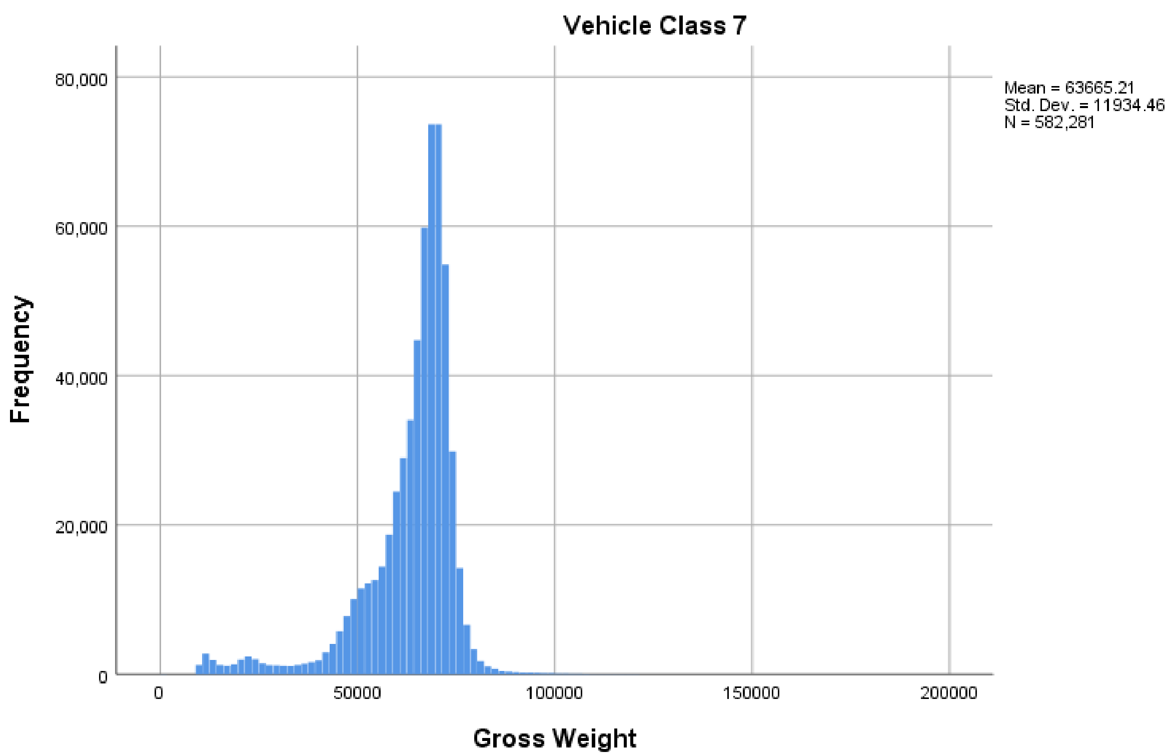

Figure B-3. Vehicle Class 7

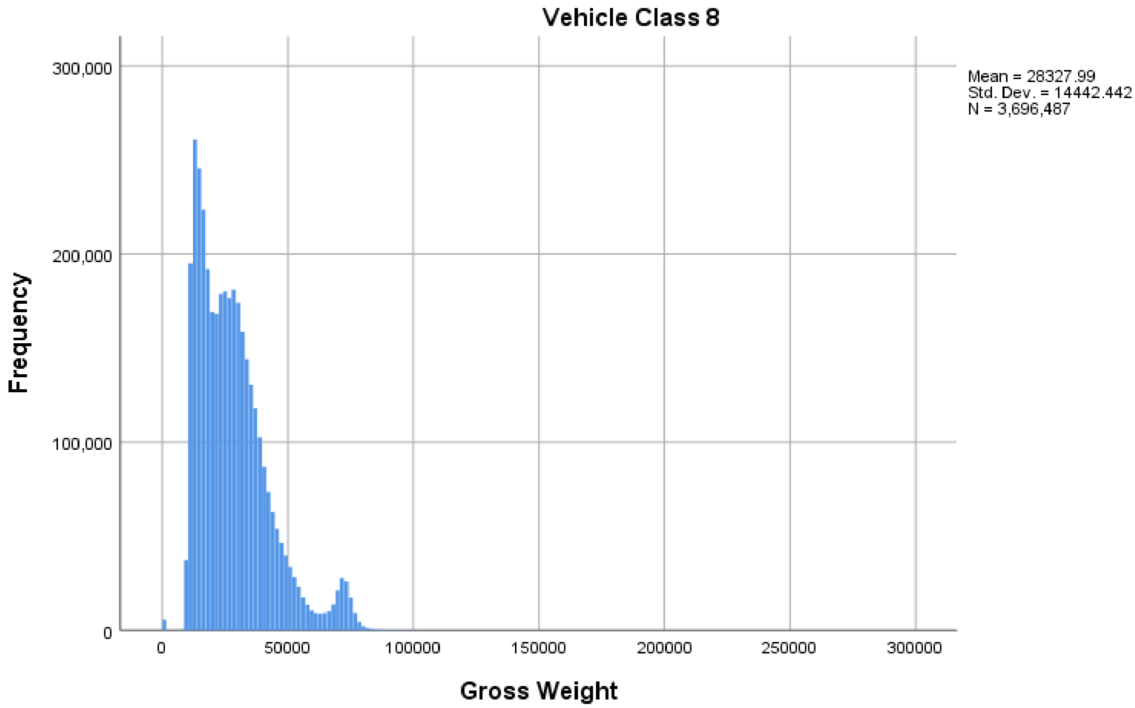

Figure B-4. Vehicle Class 8

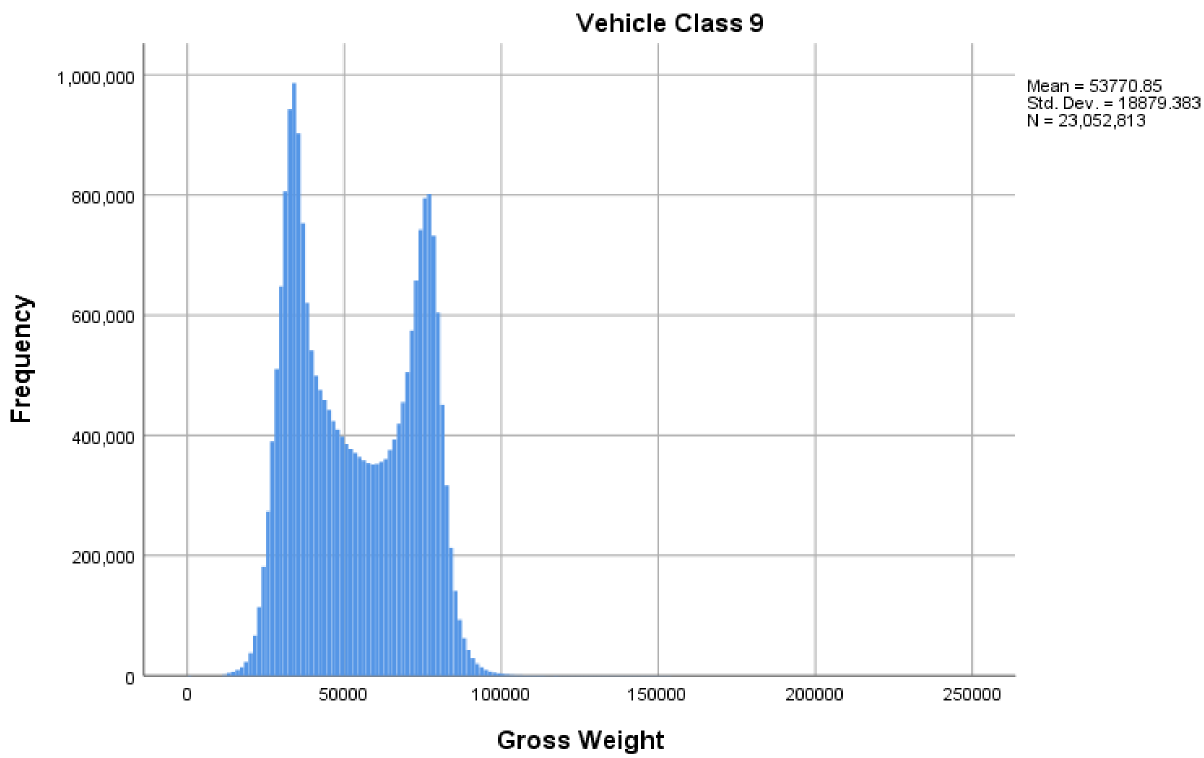

Figure B-5. Vehicle Class 9

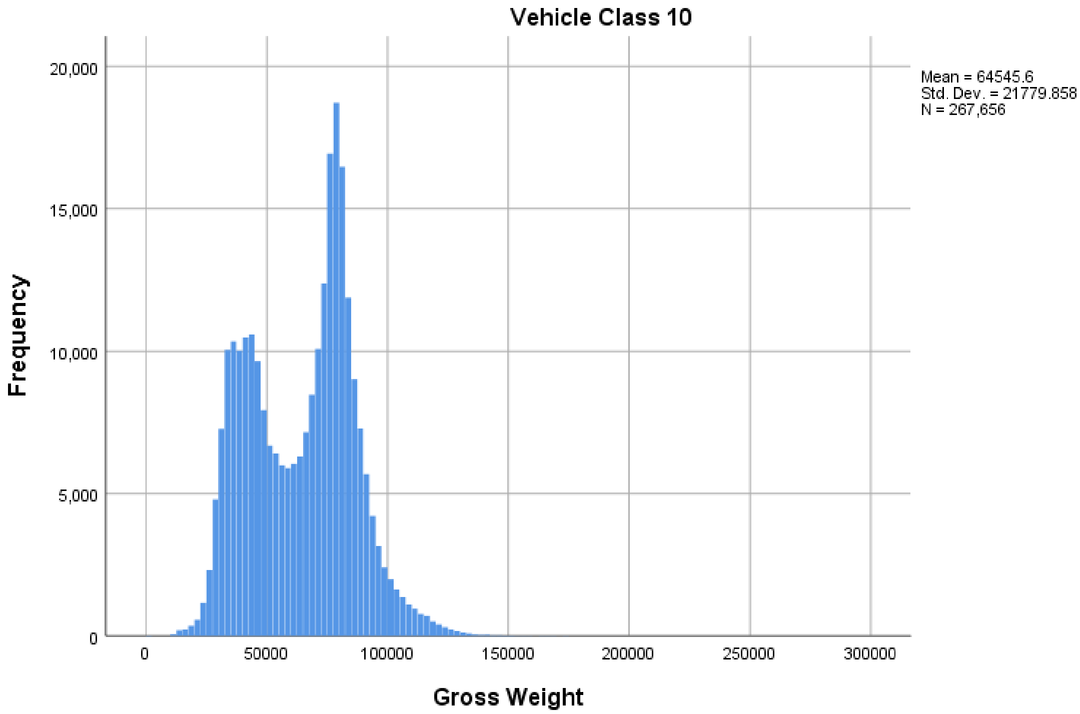

Figure B-6. Vehicle Class 10

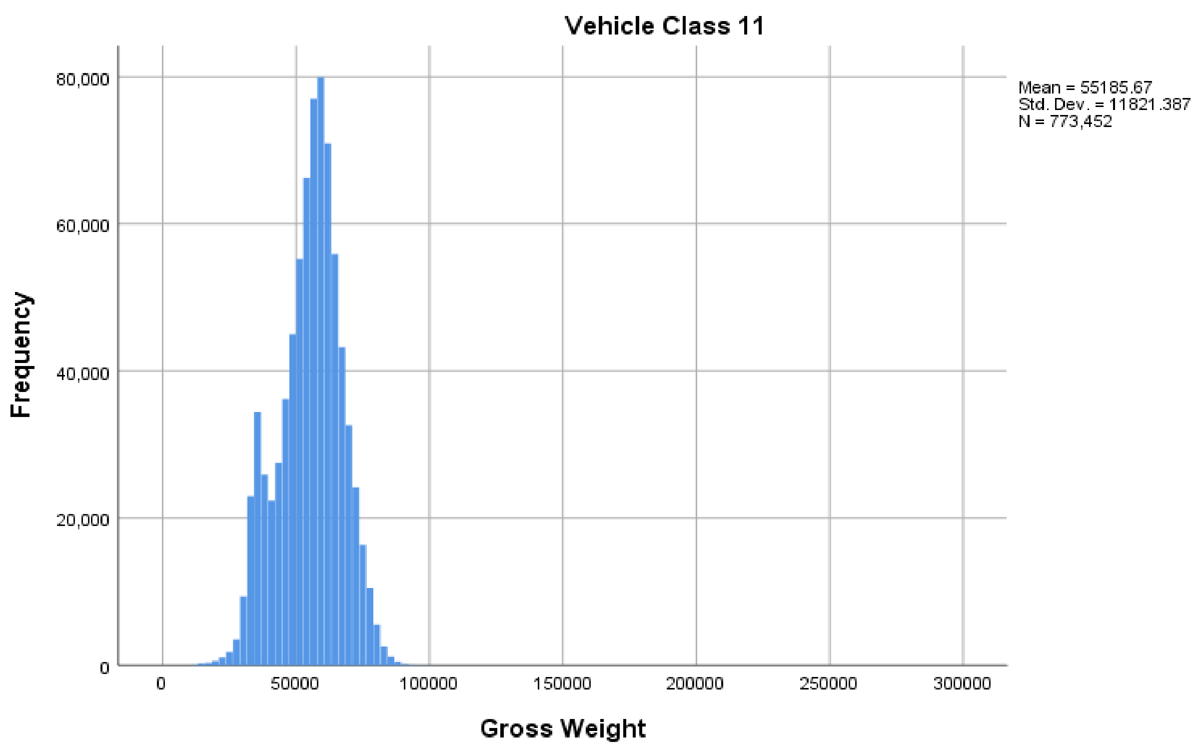

Figure B-7. Vehicle Class 11

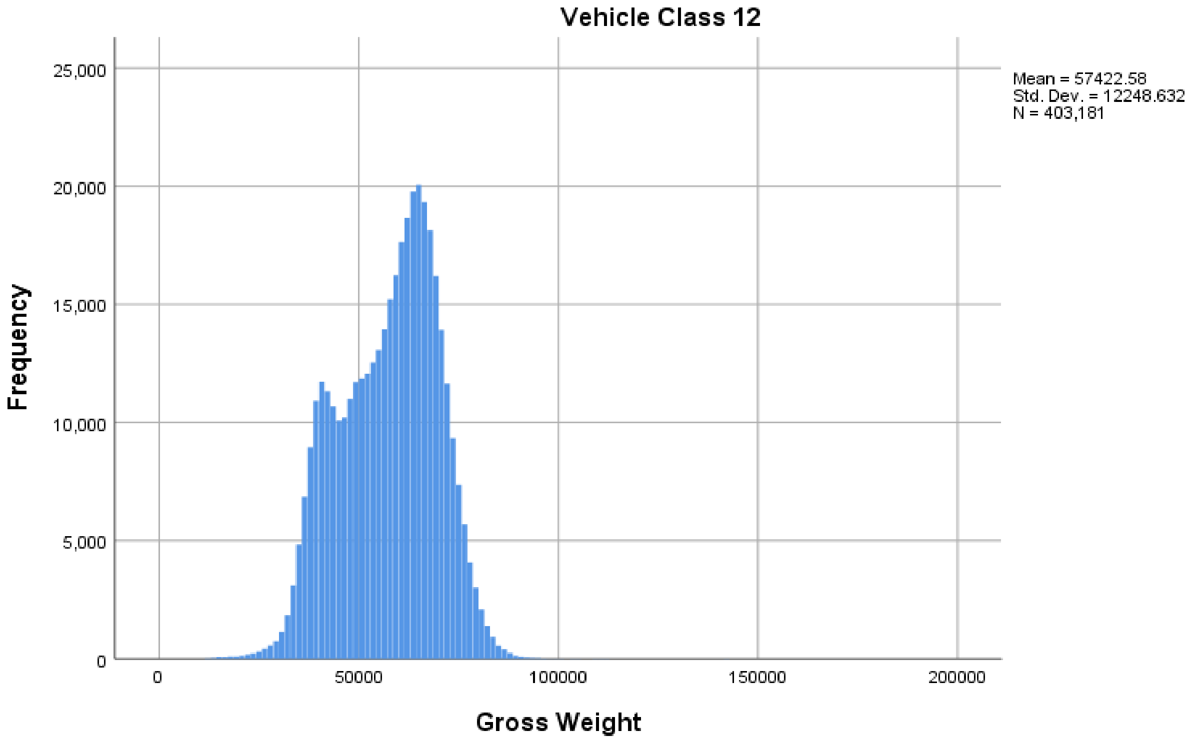

Figure B-8. Vehicle Class 12

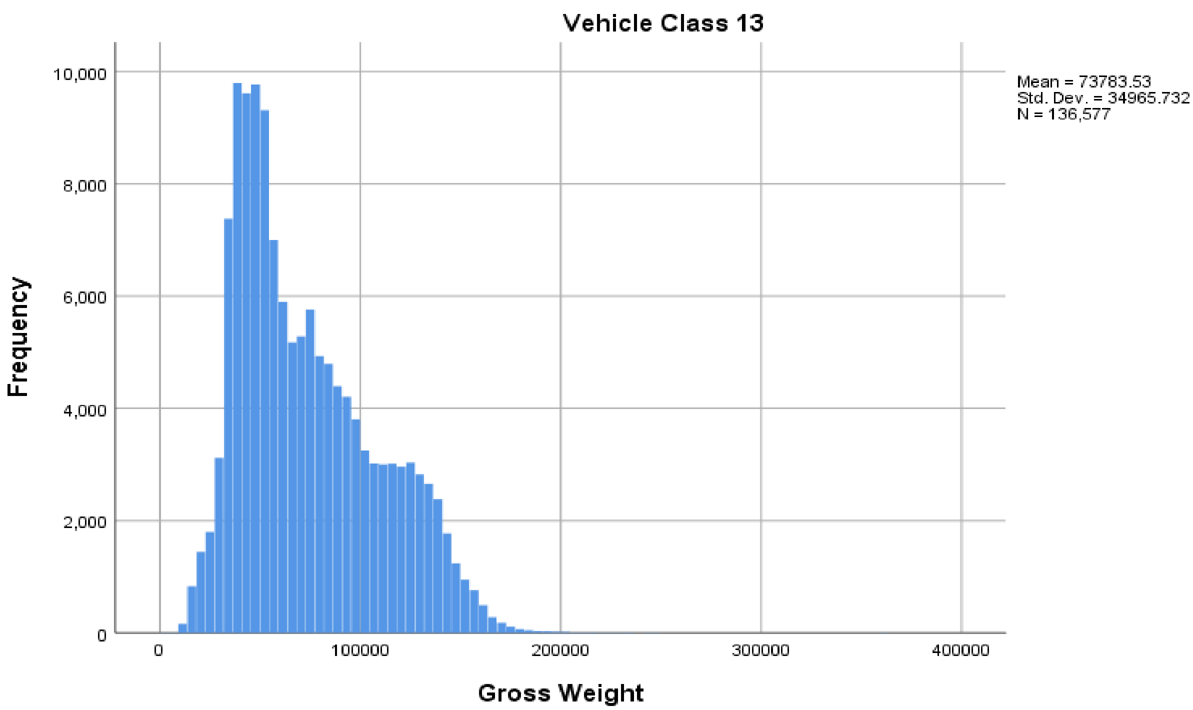

Figure B-9. Vehicle Class 13

APPENDIX C. Average Truck Tonnage Weight by Month

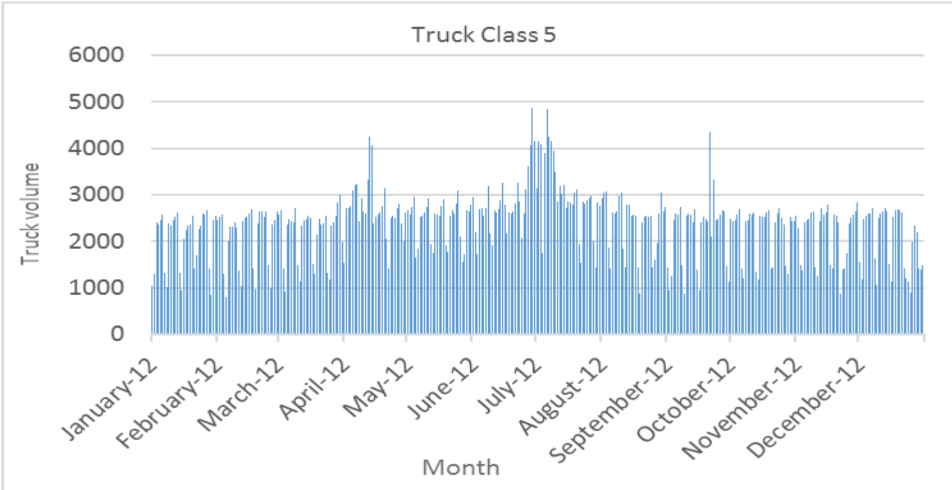

Figure C- 1. Average Tonnage of Truck Class 5

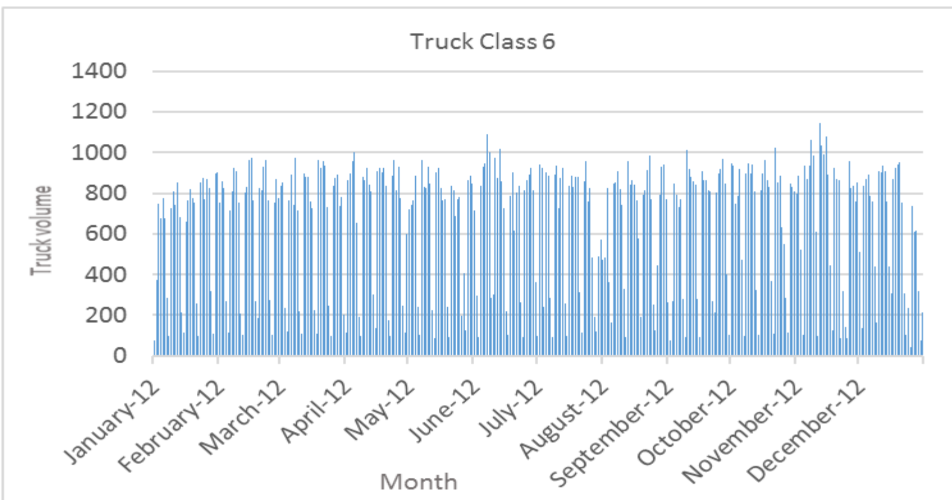

Figure C- 2. Average Tonnage of Truck Class 6

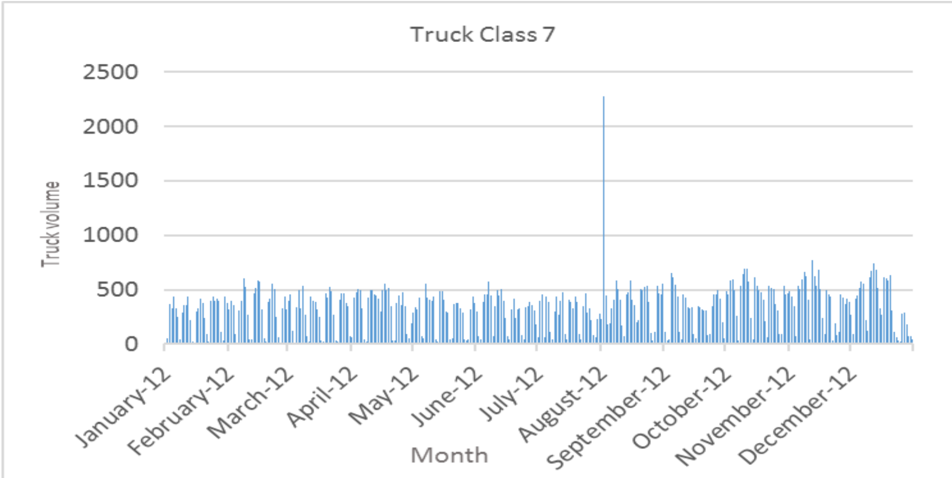

Figure C- 3. Average Tonnage of Truck Class 7

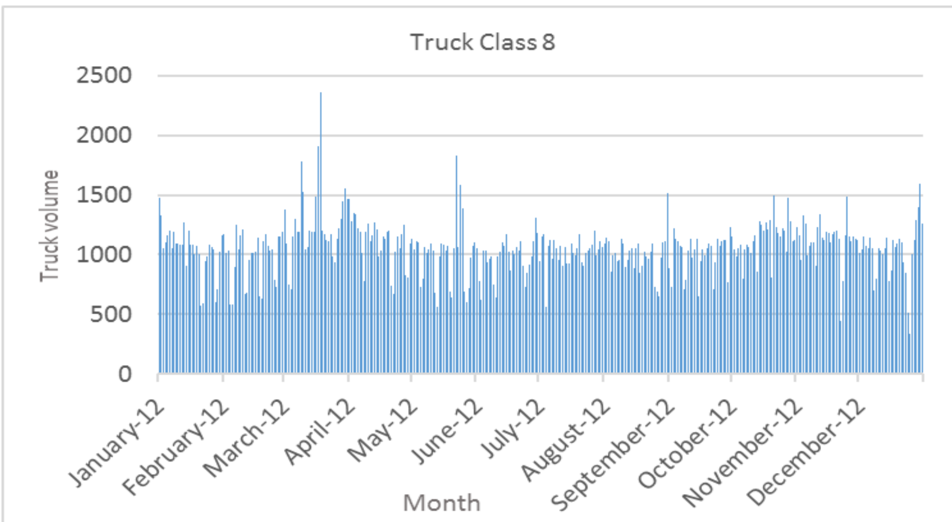

Figure C- 4. Average Tonnage of Truck Class 8

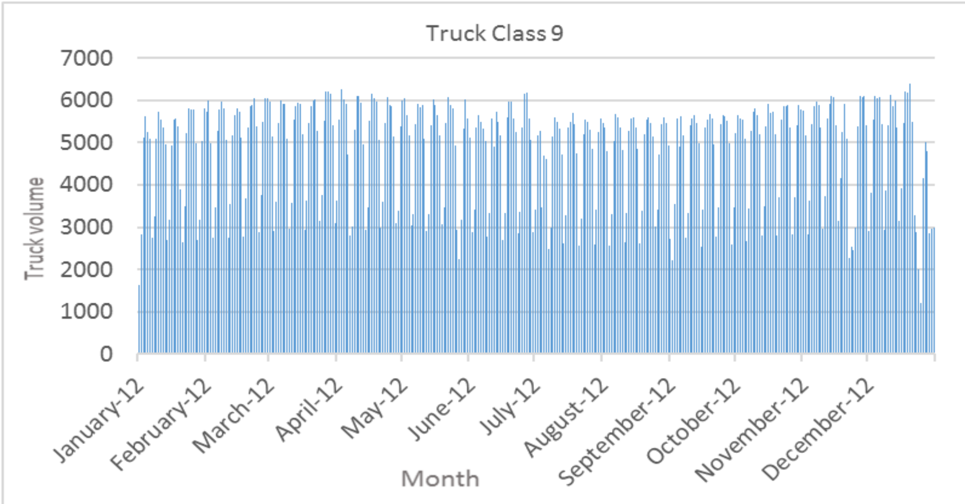

Figure C- 5. Average Tonnage of Truck Class 9

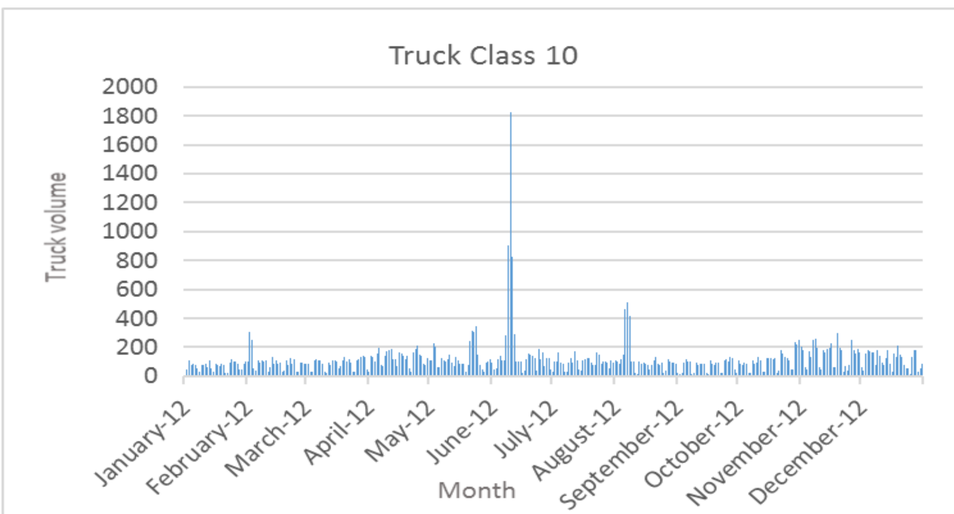

Figure C- 6. Average Tonnage of Truck Class 10

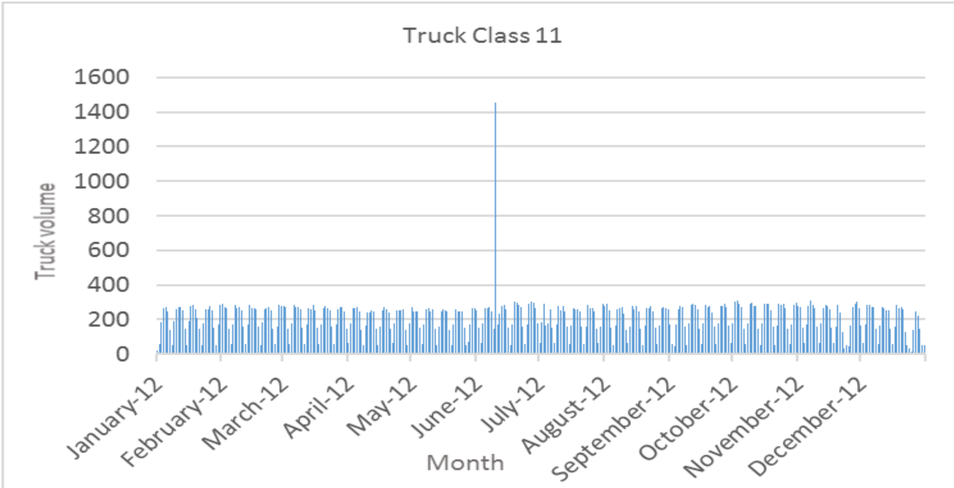

Figure C- 7. Average Tonnage of Truck Class 11

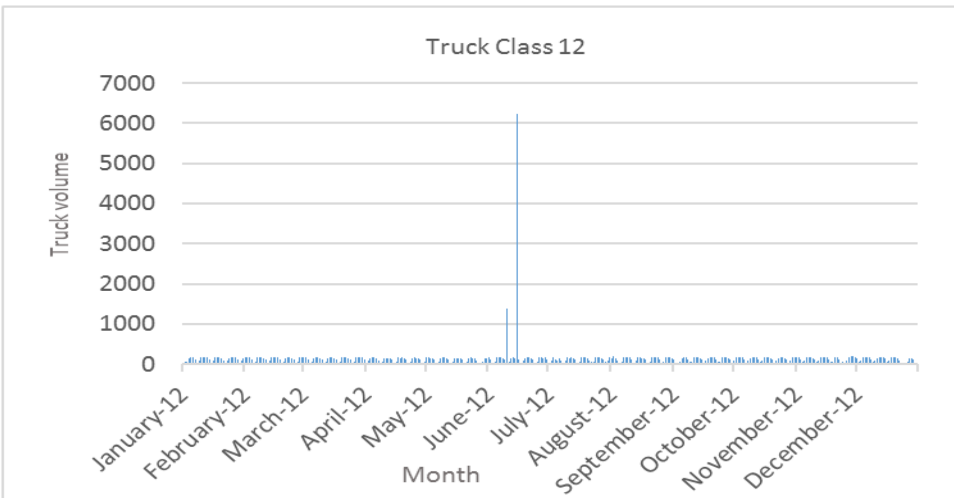

Figure C- 8. Average Tonnage of Truck Class 12

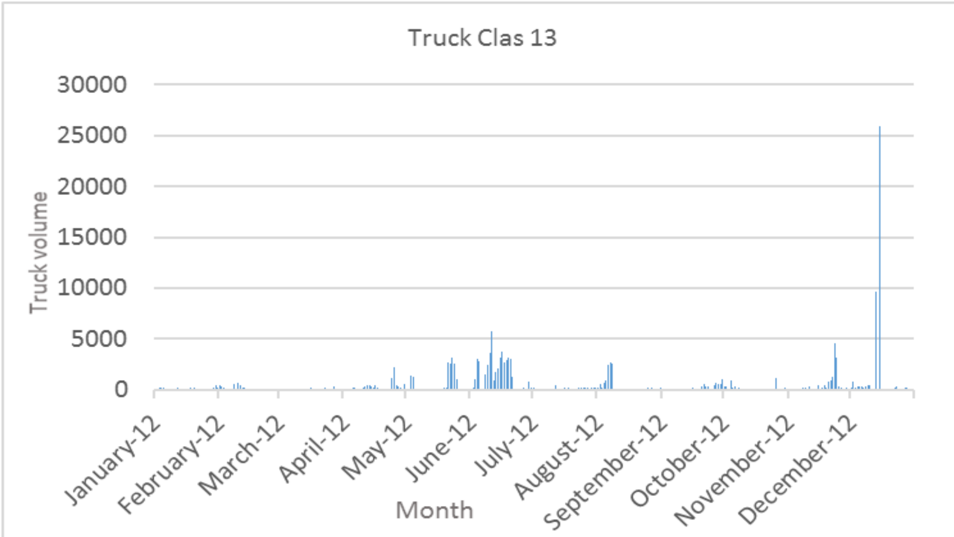

Figure C- 9. Average Tonnage of Truck Class 13

APPENDIX D. Empty Vehicle Average Weight Estimation

Table D-1. Empty Vehicle Average Weight

Truck Class	Class Definition	Class Includes	Number of Axles	Estimated Empty Vehicle Weight (lbs)
5	Two-Axle, Six-Tire, Single-Unit Trucks	Two-axle trucks	2	7670
6	Three-Axle Single-Unit Trucks	Three-axle trucks Three-axle tractors without trailers	3	13347
7	Four or More Axle Single-Unit Trucks	Four-, five-, six- and seven-axle single-unit trucks	4 or more	13379
8	Four or Fewer Axle Single-Trailer Trucks	Two-axle trucks pulling one- and two-axle trailers Two-axle tractors pulling one- and two-axle trailers Three-axle tractors pulling one-axle trailers	3 or 4	26414
9	Five-Axle Single-Trailer Trucks	Two-axle tractors pulling three-axle trailers Three-axle tractors pulling two-axle trailers Three-axle trucks pulling two-axle trailers	5	31427
10	Six or More Axle Single-Trailer Trucks	Multiple configurations	6 or more	32341
11	Five or Fewer Axle Multi-Trailer Trucks	Multiple configurations	4 or 5	37139
12	Six-Axle Multi-Trailer Trucks	Multiple configurations	6	37230
13	Seven or More Axle Multi-Trailer Trucks	Multiple configurations	7 or more	40940

APPENDIX E. Telemetered Traffic Monitoring Sites Clustering

Tables:

Telemetered Traffic Monitoring Sites Clustering Based on Weigh in Motion Stations within 20 Miles – 2012

Tables E- 1. TTMS Clustering Based on WIM Stations within 20 Miles – 2012

TTMS based on WIM type 1 (9904)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
141	Point	31,282	260323	No	SR-H ST,1000' SOUTH	Y	9	52.6	1.6
142	Point	3,004	260231	Yes	SR-45/US-27,0.26 MI N	Y	9.5	53.8	12.2
143	Point	24,604	260185	Yes	SR-24, 1.5 MI NORTH	Y	9	52.5	6.5
144	Point	6,210	260043	Yes	SR-121,0.8 MILES	Y	9.5	78.7	5.8
159	Point	58,281	269904	Yes	SR-93/I-75,3 MI N OF	Y	10.5	56.2	19
179	Point	24,183	360118	Yes	SR-25/US-301,0.3 MI N	Y	9.5	52.2	13.6

TTMS based on WIM type 1 (9952)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
287	Point	16,347	899921	No	SR-5/US-1,1.9 MI N OF	Y	9	65.1	6.5
321	Point	2,559	890289	Yes	SR 76 / KANNER HWY	Y	9.5	54.4	11.4
329	Point	9,0587	930217	Yes	SR-9/I-95,0.8 MI N OF	Y	8	56.2	8.8
331	Point	169,693	930174	Yes	SR 9 / I-95 @	Y	8	51.5	6.3
332	Point	4,603	930140	Yes	SR-710/BEELIN	Y	9	59.6	20
333	Point	64,506	930101	Yes	SR80/SOUTHERN	Y	9	60.3	4.6
335	Point	16,123	930087	No	SRA1A,0.1 MI E OF	Y	9	60.7	11.3
340	Point	96,366	939952	No	I-95 WIM, 2.4 MI N OF	Y	8	56.2	7.5
346	Point	39,661	970417	Yes	SR-91, S OF	Y	10.5	57.5	11.9
347	Point	50,402	970416	Yes	SR-91, S OF PGA	Y	9.5	53.2	9.9

TTMS based on WIM type 1 (9923) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
153	Point	60,440	729923	Yes	SR-9/I-95,1.5 MI N OF	Y	9	53.3	16.6
252	Point	3,827	720236	Yes	SR-A1A,NORTH OF FT	Y	9	55.4	4.5
254	Point	66,139	720216	Yes	SR-9A,0.7 MI S OF SR-	Y	9	52.8	5.2
255	Point	36,116	720172	No	SR-21,S END OF	Y	9	64.7	2.6
256	Point	123,731	720171	Yes	SR-9/I-95,0.7 MI N OF	Y	9	55	7.3
257	Point	48,732	720161	No	SR-10/US-90(ATL	Y	9	57.3	2.5
262	Point	18,939	740182	Yes	SR-A1A&301,0.4 MI W	Y	9	55.5	9.7
263	Point	55,639	740132	Yes	SR-9/I-95,2.0 MI S OF	Y	9	53.5	17.6
265	Point	62,341	729914	Yes	SR-9A/I-295,3 MI N OF	Y	9	52.8	9.4

TTMS based on WIM type 2 (9901) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
171	Point	8,927	350279	Yes	SR-10/US-90,47' E OF	Y	9.5	58.7	4.1
205	Point	24,117	549901	Yes	SR 8 (I10) 0.66 MILE	Y	10.5	53.8	18.9
206	Point	5,056	540312	No	SR 20/US 27,.665 MI E	Y	9.5	55.8	16
207	Point	1,272	540245	Yes	SR 59 1150' NORTH OF	Y	9.5	59.4	14

TTMS based on WIM type 2 (9920) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
15	Point	32,742	110177	Yes	SR-500/US-441,0.3 MI E	Y	9	55.7	4.9
131	Point	37,701	180358	No	SR-93/I-75,0.5 M N OF	Y	10.5	55.8	20.3
145	Point	39,544	189920	Yes	SR-93/I-75,3.5 MI S OF	Y	10.5	56.8	20.3
355	Point	35,500	979931	No	SR-91, S OF CR468	Y	10.5	55.7	15.4

TTMS based on WIM type 2 (9936) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
147	Point	8,844	290286	Yes	SR-47/US-441,0.1 MI	Y	9	51.6	7
148	Point	19,329	290269	No	SR-8/I-10,0.45 MI E	Y	10.5	53.6	26
149	Point	43,123	290320	Yes	SR-93/I-75,BETWEEN	Y	10.5	54.7	24.3
161	Point	6,490	290037	Yes	SR-10/US-90,0.6 MI.	Y	9.5	56.5	5.5
167	Point	19,239	299936	Yes	SR-8/I-10,@CR-250	Y	10.5	54.1	25.3

TTMS based on WIM type 3 (9949) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
182	Point	25,120	480282	Yes	SR-296,320' E	Y	9	51.7	1.8
190	Point	34,939	480156	Yes	I-10, 0.6 MI W SR-297	Y	9	54.3	14.9
191	Point	4,902	480048	Yes	SR10/US90,1 MI E OF	Y	9	58.3	8.4
192	Point	11,558	480325	Yes	SR30/US98,1 MI E OF	Y	9	54.2	4.6
195	Point	57,731	480368	No	I-110, 0.6 MI S OF	Y	9	65.3	9.5
209	Point	45,979	489949	Yes	I-10, 1.6 MI E OF SR-	Y	9	53.7	11.9
210	Point	30,387	489916	Yes	SR-95/US-29, 0.8 MI N	Y	9	62.5	5.7
231	Point	51,700	580261	No	SR-30/US-98,267' E	Y	9	55.7	3.3
233	Point	12,288	589937	Yes	SR-87,180' N OF	Y	9	58.8	3.8

TTMS based on WIM type 3 (9951) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
124	Point	79,260	160363	No	SR-400/I-4, 2.1 MI E	N	9	51.9	12.7
126	Point	44,834	160310	Yes	SR-25/US-27,280' S OF	Y	9	52.3	8.1
127	Point	10,013	160275	Yes	SR-544,0.24 MI W CR-	Y	9	53.8	9.5
128	Point	23,180	160274	Yes	SR-37,0.4 MI S OF	Y	9	58.9	4.6
129	Point	5,215	160230	Yes	SR-33,0.057 MI	Y	9.5	58.6	20
135	Point	77,499	169951	Yes	I-4, 0.6 MI W OF SR-	Y	9	51.9	11.2
136	Point	14,225	169927	Yes	SR-546/MEMORIAL	Y	9	63.4	13.2
349	Point	23,169	970407	Yes	POLK PKWY/SR-570,	Y	10	60.6	9.9

TTMS based on WIM type 3 (9905) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
259	Point	38,895	720062	Yes	SR-212/US-90,0.1 MI	Y	9	55.7	2.7
261	Point	35,587	710189	Yes	SR-15/US-17,0.6 MI S	Y	9	55.4	5
266	Point	88,484	729905	Yes	SR-9/I-95,2.5 MI S OF	Y	9	58.5	12.5
283	Point	23,776	780360	Yes	SR-13,0.276 MI. S OF	Y	9	61.2	2.6

TTMS based on WIM type 3 (9929) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
245	Point	26,283	700322	Yes	SR-9/I-95,0.9 MI S OF	Y	9	54.5	19.2
281	Point	9,525	790170	Yes	SR-442, 0.53 MI E OF	Y	9	73.2	5.6
282	Point	36,921	790133	Yes	I-95,2.7 MI N OF	Y	9	54.5	13.5
289	Point	11,053	799929	Yes	SR-5/US-1,0.25 MI N	Y	9	52.6	4

TTMS based on WIM type 3 (9931) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
344	Point	40,330	970428	Yes	SR-91, SE OF CR561	Y	10	54.4	14.8

TTMS based on WIM type 3 (9950) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
6	Point	62,897	30191	Yes	SR-93/I-75,0.5 MI N OF	Y	9	56.6	6.9
7	Point	19,444	30351	Yes	SR-93/I-75,W OF	Y	10.5	53.8	9.9
8	Point	38,102	30094	Yes	SR-90/US-41,.3 MI SE	Y	9	54.6	2.9
13	Point	75,022	39950	Yes	I-75, 1.25 MI N OF CR-	Y	9	55.1	7.1
26	Point	35,000	126048	No	DANIELS PKWY, E OF	Y	9	64	3.9
27	Point	21,300	126047	No	SUMMERLIN RD S OF	Y	9	55.6	3.9
28	Point	35,633	126046	No	GLADIOLUS DR, W	Y	9	52.6	3.5
29	Point	19,599	126045	No	SR 739/METRO	Y	9	54	5.6
30	Point	13,657	126044	No	ESTERO BLVD, 100' N	Y	9	53.2	3
32	Point	25,825	126042	No	BONITA BEACH	Y	9	55	3.5
37	Point	18,254	126036	No	SUMMERLIN RD,	Y	9	55.1	3.5
40	Point	1,500	126033	No	CHAMBERLIN PKWY,	Y	9	82.4	3.9
41	Point	53,383	126031	No	DANIELS PKWY, 150'	Y	9	52.5	5.6
53	Point	71,868	120184	Yes	SR-93/I-75, 1.7 MI S OF	Y	9	56.2	8.3
55	Point	23,689	126061	No	BEN HILL	Y	9	56.2	3.9
56	Point	23,983	126060	No	BEN HILL GRIFFIN	Y	9.5	53.7	3.9
57	Point	22,963	126059	No	MIDFIELD	Y	9	53.9	12.4
62	Point	25,846	126053	No	ALICO RD, 1800' W OF	Y	9.5	54.5	3.9
63	Point	50,058	126052	No	SR 876/DANIELS	Y	9	59.6	3.9
64	Point	1,570	126051	No	PAUL J DOHERTY	Y	9	61.6	3.9
66	Point	40,796	126030	No	DANIELS PKWY, 100	Y	9	51.7	3.9
70	Point	37,000	126025	No	US 41, 500' S OF	Y	9	53	4.1
71	Point	32,441	126023	No	US 41, 0.25 MI N OF	Y	9	54.5	2.9
75	Point	25,766	126019	No	SUMMERLIN RD,	Y	9	52	3.5
78	Point	11,526	126016	No	OLD 41 RD/CR 887,	Y	9	59.8	2.9
79	Point	27,530	126015	No	CORKSCREW RD,	Y	9	51.2	3.9
84	Point	27,084	126010	No	ALICO RD, 1000' W OF	Y	9	57.5	3.9
86	Point	22,194	126008	No	SR 865/SAN CARLOS	Y	9	54.7	3
87	Point	23,386	126007	No	BONITA BEACH RD,	Y	9	53.2	3

TTMS based on WIM type 3 (9906) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
275	Point	41,402	770197	No	SR-434,1.6 MI E OF I-	Y	9	51.4	3.8
278	Point	132,66	770343	Yes	SR-400/I-4,1.6 MI E OF	Y	8	52.5	6.5
279	Point	10,275	770299	Yes	SR-46,0.4 MI W OF ST.	Y	9.5	53.6	9.7
280	Point	37,345	770102	Yes	ON US-17&92,1.6 MI S	Y	9	53.3	3.3
286	Point	13,000	799925	No	US-92,0.25 MI E OF	Y	9.5	62.6	5.2
288	Point	93,854	799906	Yes	ON I-4,169' E OF	Y	9	55.6	8

TTMS based on WIM type 3 (9947) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
290	Point	48,693	870266	Yes	SR-90/US-41/SW 8TH	Y	9	65	3.1
291	Point	24,056	870258	Yes	SR-915/NE 6TH	Y	9	52.1	1.9
292	Point	35,380	870193	Yes	SR-878, 0.2 MI W SR	Y	9	78.2	1.9
293	Point	48,843	870188	Yes	SR-94/KENDALL	Y	9	59.2	1.6
294	Point	125,427	870187	No	SR-836, 1.4 MI E OF	Y	8	65.6	3.3
295	Point	80,978	870178	Yes	SR-5/US-1,S OF	Y	9	55	1.8
296	Point	135,000	870137	Yes	SR 826/PALMETTO	Y	8	51.6	6
297	Point	100,664	870108	Yes	SR-112/I-195, 1 MI E	Y	8	52.9	2.4
298	Point	21,776	870096	Yes	SR-9, 0.4 MI SW OF	Y	9	52.2	8.8
299	Point	56,921	860222	Yes	SR 817 /UNIV DR 0.1	Y	9	52.7	1.9
301	Point	184,000	860186	No	SR 862 / I-595 - 0.2 MI	Y	8.5	50.7	4.3
302	Point	151,562	860362	No	SR-93/I-75, 0.78 MI N	Y	8.5	63.4	3.8
304	Point	241,000	860331	No	SR9/I95,.1 M N OF	Y	8	51	5.5
305	Point	27,167	860176	Yes	SR 5 / US 1 - 0.1 MI N	Y	9	53.7	2
306	Point	66,952	860150	Yes	SR 858/HALLANDALE	Y	9	51.5	2.5
311	Point	25,533	860256	Yes	SR-818/GRIFFIN	Y	9	61.9	3.7
312	Point	13,144	860306	Yes	SR-820/HOLLYWOOD	Y	9	56.9	2
313	Point	93,662	870031	Yes	SRA1A,MCARTHR	Y	9	53.4	2.3
318	Point	32,499	879947	Yes	US-27, 2.1 MILES N OF	Y	9	62.8	15.5
351	Point	106,819	970403	Yes	SR-91, N OF	Y	9.5	51.6	7.3
352	Point	108,422	970267	Yes	HEFT/SR-821, S OF	Y	9.5	58.8	6.6
353	Point	87,017	979934	Yes	HEFT/SR-821, N OF	Y	9.5	61.9	7.1

TTMS based on WIM type 3 (9913) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
319	Point	51,090	890334	Yes	SR 9 / I-95 - 0.1 MI S	Y	9	62.6	11.5
320	Point	57,412	890332	Yes	SR5/US1,@ N END OF	Y	9	60.3	3.1
322	Point	7,297	890259	Yes	SR A1A - 0.06 MI N OF	Y	9	52.5	3.1
338	Point	4,039	940195	Yes	SR 70 / 1.18 MI E OF	Y	9.5	56.2	14.9
339	Point	2,319	940144	Yes	CR 68/ORANGE AVE	Y	9.5	62.6	24.2
341	Point	46,500	940260	No	SR 9/I-95-0.6 MI S OF	Y	9	53	15.2
345	Point	26,954	970421	Yes	SR-91, N OF	Y	10.5	60.6	13.4
356	Point	38,122	979913	Yes	SR-91, N OF BECKER	Y	10.5	57.6	12.7

TTMS based on WIM type 3 (9926) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
17	Point	130,575	109926	Yes	SR-93A/I-75,1.25 MI N	Y	9	58.3	7.5
19	Point	81,781	109922	Yes	SR-93/I-275,0.25MI N	Y	8.5	68.9	5
44	Point	27,598	100373	Yes	US-41, 0.5 MI S OF SR-	Y	9	72.9	10.3
45	Point	57,596	100372	No	SR-580, 0.36 MI E OF	Y	9	52.3	6.6
46	Point	48,944	100321	No	SROWLER AV,1450' E	Y	9	59.9	2.8
47	Point	5,868	100276	No	SR-674,686' W OF	Y	9.5	52.6	15.5
48	Point	31,506	100162	Yes	SR-60,1 MI EAST OF	Y	9	55.7	6.9
49	Point	118,776	100106	No	SR-400/I-4,UNDER	Y	9	54	9.7
50	Point	11,848	100080	Yes	SR-600/US-92, 0.2 MI	Y	9	55	8.4
54	Point	81,013	140190	No	SR-93/I-75, 1.0 MI N	Y	9	54.7	12.4
93	Point	54,644	140013	No	SR-45/US-41,0.4 MI. N	Y	9	65.9	3.8
122	Point	29,398	150086	Yes	SR-600/US-92,1 MI E	Y	9	52.9	4

TTMS based on WIM type 3 (9919) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
224	Point	64,312	709919	Yes	SR-9/I-95, 2 MI S OF	Y	9	51.2	10.9
243	Point	43,001	700113	Yes	SR-520, 0.144 MI. W	Y	9	52.1	3.2
251	Point	5,892	700223	Yes	SR-407,0.7 MI	Y	9.5	52.7	6.8
267	Point	38,427	750336	Yes	SR-528,0.7 MI W OF	Y	10.5	52.6	6.7

TTMS based on WIM type 4 (9948) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
125	Point	8,617	160319	Yes	SR-35/US-17,0.3 MI N	Y	9.5	51.9	19
139	Point	21,001	169948	Yes	SR-25/US-27,0.8 MI S	Y	9	51.9	13.6

TTMS based on WIM type 4 (9934) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
308	Point	21,684	860357	Yes	SR93/I75,2 MI W OF	Y	10.5	53.8	10.4
354	Point	80,000	979933	Yes	SAWGRASS	Y	10	54.8	4

TTMS based on WIM type 4 (9933) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
300	Point	13,302	860215	No	SR-A1A,0.1 MI N OF	Y	9	54.3	2.3
303	Point	47,571	860214	Yes	SR 814/ATLANTIC	Y	9	54.8	3.2
307	Point	192,443	860163	Yes	SR-9/I-95,NE OF 48TH	Y	8	50.7	5.8
309	Point	44,141	860255	Yes	SR834/SAMPLE RD,.35	Y	9	51.5	3.9
310	Point	48,900	860298	Yes	SR7/US441,.1 MI S OF	Y	9	52.9	2.5

TTMS based on WIM type 4 (9940) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
146	Point	7,433	509940	Yes	SR-267,1 MI N OF I-	Y	9	54.4	6.4
199	Point	57,722	550304	Yes	SR-8/I-10,1 MI W OF	Y	9	51.4	11.5
201	Point	5,931	550211	Yes	SR-20,BTWN COES	Y	9	78.7	7.1
203	Point	12,496	550207	No	SR-155/MERIDIAN	Y	9	69.8	2.5
212	Point	6,588	500054	Yes	SR-63/US-27,0.7 MI S	Y	9.5	60.6	17.7
213	Point	1,426	500281	Yes	SR-267,0.21 MI S OF	Y	9.5	54	10.9
215	Point	26,626	500220	Yes	SR-8/I-10,250' W OF	Y	10.5	54.3	19.4
226	Point	2,225	560301	Yes	SR-12,1.7 MI S OF	Y	9.5	60	12.2

TTMS based on WIM type 4 (9918) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
18	Point	2,928	50272	Yes	SR-78,0.9 MI NORTH	Y	9.5	52.3	26.9
22	Point	13,526	79918	Yes	SR-25&80/US-27,1.6	Y	9.5	57.4	20.9

TTMS based on WIM type 5 (9943) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
181	Point	1,509	470365	Yes	SR-69,1.4 MI N OF	Y	9.5	54.5	10.2
184	Point	3,272	470337	Yes	SR-71,.4 M N OF JIM	Y	9.5	53.1	8.4
193	Point	8,400	470173	No	SR-20,0.6 MI EAST	Y	9.5	52.7	11.2
216	Point	1,939	530248	No	SR-2,575' WEST OF	Y	9.5	57.5	30.7
218	Point	20,521	530218	Yes	SR-8/I-10,1 MI E OF	Y	10.5	54.1	24.3
219	Point	15,320	530117	Yes	SR-10/US-90,W OF	Y	9	51.1	5.5
225	Point	4,873	539943	Yes	SR-10/US-90,1.1 MI	Y	9.5	56	7.2

TTMS based on WIM type 5 (9907) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
189	Point	2,514	470328	Yes	SR-71,0.4 MI SOUTH	Y	9.5	62.2	17.3

TTMS based on WIM type 5 (9909) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
134	Point	1,933	300234	Yes	SR-349,0.1 MI	Y	9.5	54.4	8.8
169	Point	11,488	340116	Yes	SR-55/US-19,2 MI S	Y	9.5	53.3	9.1
170	Point	6,404	340278	No	SR-55/US-27A,158'	Y	9.5	55.3	8.1
172	Point	11,544	349909	Yes	SR-55/US-19,2 MI S	Y	9.5	53.3	7.1

TTMS based on WIM type 5 (0192) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
183	Point	10,719	460359	Yes	US231,0.250MI. N.	Y	9	63.4	10.4
186	Point	1,741	460192	Yes	SR-20,1.1 MI. WEST	Y	9	55.2	13.2
188	Point	28,373	460308	No	SR-77,1865' NORTH	Y	9	56.1	4.2
194	Point	13,505	469907	Yes	SR-75/US-231,2.9 MI	Y	9	61.4	10.1
248	Point	4,678	610254	Yes	SR 77, 406' NORTH	Y	9.5	56.9	5.8

TTMS based on WIM type 6 (9937) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
228	Point	1,465	580285	No	SR-89,1270' SOUTH	Y	9.5	53.2	9.7
232	Point	2,131	580251	Yes	SR-10/US-90,0.9 MI	Y	9	53	11.4
234	Point	1,372	580330	Yes	SR-4,0.7 MI WEST	Y	9.5	58.5	16.2

TTMS based on WIM type 6 (0219) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
155	Point	22,326	570318	Yes	SR-8/I-10,@NTIOCH	N	10.5	53.5	20.4
156	Point	50,256	570293	No	SR-30/US-	Y	9	52.8	3.1
222	Point	27,500	570250	No	SR-189,1.6 MI N OF	Y	9	51.9	4.7
223	Point	14,567	570219	Yes	SR-85,1.9 MI N SR-	Y	9	71.2	4.1
236	Point	12,680	570122	Yes	SR-10/US-90,2 MI W	Y	9	52.4	6.6
241	Point	44,907	600168	Yes	SR 30 (US 98) 0.1 MI	Y	9	51.1	3.3

Tables:

Telemetered Traffic Monitoring Sites Clustering Based on Weigh in Motion Stations between 20 and 40 Miles – 2012

Tables E-2. TTMS Clustering Based on WIM Stations between 20 and 40 Miles – 2012

TTMS based on WIM type 1 (9904)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
130	Point	1,939	290297	Yes	SR-47,2.2 MI S OF	Y	9.5	56.4	13.4
162	Point	4,347	280073	No	SR-100,1.3 MI	Y	9.5	52.5	14.8
163	Point	20,971	280018	Yes	SR-200/US-	Y	9.5	54.6	17.5
176	Point	74,915	360317	Yes	I-75,0.23 MI N OF	Y	9	55.8	16.8
177	Point	19,632	360264	Yes	SR-40,566'E OF	Y	9	58.8	4
178	Point	27,549	360249	Yes	SR-464,140' EAST	Y	9	59.9	3.6
276	Point	10,534	760240	Yes	SR-20,0.4 MI	Y	9.5	59.2	5.7

TTMS based on WIM type 1 (9952)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
323	Point	24,112	930010	Yes	SR 5 / US 1 - N OF	Y	9	57	2.1
330	Point	174,49	930198	Yes	SR9/I95,@SW	Y	8	60.9	6.2
334	Point	19,640	930099	Yes	SR-7/US-441,0.7	Y	9	69.9	6.8
337	Point	5,292	930257	Yes	SR-715,0.7 MI. S.	Y	9	53.5	13.8
348	Point	75,718	970413	Yes	SR-91, N OF	Y	9.5	58.4	8.6

TTMS based on WIM type 1 (9923)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
160	Point	2,661	270232	Yes	SR-121,240'	Y	9.5	59.1	11.4
253	Point	3,600	720235	No	SR-200/US-	Y	9	56.6	27.7
258	Point	43,700	720109	Yes	SR-8/I-10,@CR-	Y	9	54.2	20.6
260	Point	16,773	710233	Yes	SR-21,0.124 MI	Y	9	55.1	6.5
264	Point	8,611	740047	Yes	SR15/US1,7 MI N	Y	9.5	53.3	21.1

TTMS based on WIM type 2 (9901)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
164	Point	1,089	320277	Yes	SR-6,0.4 MI EAST	Y	9.5	53.5	26.6
166	Point	35,180	320112	No	SR93/I75,@STAT	Y	10.5	54.4	20.9
180	Point	1,738	380280	Yes	SR-30/US-98,1.25	Y	9.5	54.8	26.3
198	Point	10,854	550349	Yes	SR-61/US-319,4.1	Y	9	53.4	6.9
200	Point	8,896	550300	Yes	SR-363/W,728' N	Y	9	73.1	5.6
202	Point	18,000	550209	No	SR-373/NGE	Y	7.5	59.6	3.9
204	Point	31,759	550151	Yes	SR-20/US-27,0.7	Y	7.5	63.6	1.6
227	Point	14,800	590296	No	SR 369 (US 319) 3	Y	9	67.4	4.8

TTMS based on WIM type 2 (9920)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
2	Point	17,291	20044	Yes	SR-55/US-19,0.2	Y	9	54.6	7.6
5	Point	20,000	20324	No	SR-44,0.2 MI	Y	9	51.3	5.8
14	Point	11,200	110246	Yes	SR-44,720' EAST	Y	9	54.3	7.1
16	Point	7,740	110262	Yes	SR-19,1.2 MI N	Y	9	54.4	9.2
42	Point	8,500	80294	No	SR-45/US-41,N OF	Y	9	58.1	5.9
43	Point	20,751	80283	Yes	SR-55/US-19,0.75	Y	9	54	5.1
107	Point	13,658	140079	No	SR-35/US98	Y	9	58.9	11.9
274	Point	30,734	750038	Yes	SR 50,0.5 MI E	Y	9	56.6	4.7

TTMS based on WIM type 2 (9936)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
133	Point	3,502	330149	Yes	SR-20/US-27,0.3	Y	9.5	53	15.5
165	Point	769	320202	Yes	SR-100/US-129,0.5	Y	9.5	58	30.3
173	Point	2,710	370242	Yes	SR-247,1.3 MI N	Y	9.5	55.8	11.9
174	Point	2,783	370241	Yes	SR-249/US-	Y	9.5	58.8	11.9
175	Point	24,753	370238	Yes	SR-8/I-10,0.15 MI	Y	10.5	54.2	22.2

TTMS based on WIM type 3 (9950)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
4	Point	14,535	10367	No	SR-45/US-41,4.6	Y	9.5	52.5	8.9
9	Point	13,722	30143	Yes	SR 29,0.4 MI S OF	Y	9.5	60.2	11.3
12	Point	11,613	70039	Yes	SR-80, 2.9 MILES	Y	9.5	52	11.5
25	Point	23,695	126049	No	SR 78/PINE	Y	9	57.1	5.6
31	Point	30,391	126043	No	COLLEGE PKWY,	Y	9	57.5	3.5
33	Point	25,000	126041	No	SR 739/US 41B,	Y	9	72.8	5.3
34	Point	48,000	126040	No	DEL PRADO	Y	9	56.7	5.6
35	Point	15,225	126038	No	MCGREGOR	Y	9	56.2	3
36	Point	27,286	126037	Yes	SR 867/MCGOR	Y	9	56.2	2.8
38	Point	26,622	126035	No	SUMMERLIN RD,	N	9	55.4	3.5
39	Point	17,737	126034	No	PONDELLA RD,	Y	9	69.5	5.6
51	Point	4,217	120273	Yes	SR-31,202'	Y	9.5	56.4	26.9
52	Point	47,779	120203	Yes	SR-884,1.6 MI W	Y	9	54.7	4.6
58	Point	16,871	126058	No	CHIQUITA	Y	9	51.8	12.4
59	Point	42,873	126056	No	CAPE CORAL	Y	9	64.7	5.6
60	Point	22,227	126055	No	SANTA	Y	9	51.4	5.6
61	Point	22,196	126054	No	SANTA	Y	9	54.4	3.5
65	Point	44,343	126050	No	VETERANS	Y	9	65.8	3.5
67	Point	14,973	126029	No	CR 867/MCGOR	Y	9	53.6	3.5
68	Point	19,499	126028	No	FOWLER ST, S	Y	9	53	5.6
69	Point	4,018	126027	No	STRINGFELLOW	Y	9.5	53	3
72	Point	29,292	126022	No	LEE BLVD/CR	Y	9	61.7	4.3
73	Point	22,000	126021	No	SR 82/IMMOKE	Y	9	66.6	7.4
74	Point	29,500	126020	No	SR 82/DR. MLK	Y	9	63.8	10
76	Point	12,500	126018	No	SIX MILE	Y	9	56.4	5.6
77	Point	17,888	126017	No	HANCOCK	Y	9	64.1	4.5
80	Point	51,427	126014	No	COLONIAL	Y	9	60.2	3.5
81	Point	26,602	126013	No	CAPE CORAL	Y	9	62.8	5.6
82	Point	5,213	126012	No	CR 765/BURNT	Y	9.5	55	5.6
83	Point	8,700	126011	No	BUCKINGHAM	Y	9	52.3	11.5
85	Point	50,877	126009	No	US 41, 285' N OF	Y	9	54.1	3
88	Point	26,219	126006	No	HOMESTEAD	Y	9	54.1	10.8
89	Point	25,563	126005	No	SR 80/PALM	Y	9	61.6	10.8
90	Point	10,222	126003	No	CR78/PINE	Y	9.5	52.6	5.6
91	Point	36,714	126002	No	DEL PRADO	Y	9	51.4	3.5
92	Point	40,000	126001	No	US 41, 200' N OF	Y	9	71.8	4

TTMS based on WIM type 3 (9951)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
268	Point	64,163	750204	Yes	SR-528/BEELINE	Y	9	65.2	6.2
269	Point	197,50	750196	No	SR-400/I-4, 0.4 MI	Y	8	55.3	6.1
270	Point	36,579	750175	No	SR-527/ORANGE	Y	9	51.2	5.4
271	Point	46,449	750154	No	SR-436,1.4 MI N	Y	9	56	5.2
272	Point	164,14	750130	No	SR-400/I-4,0.8 MI	Y	8	51.2	5.4
324	Point	59,133	920265	Yes	ON US-192,0.2 MI	Y	9	52.6	2.2
343	Point	33,842	970429	Yes	SR-91, S OF	Y	10.5	56.4	12.2

TTMS based on WIM type 3 (9913)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
314	Point	4,878	880139	Yes	SR 60-1.5 MI E OF	Y	9.5	53.2	29.2
315	Point	9,425	880326	Yes	SR-607/27TH	Y	9	62.7	3.1
316	Point	22,935	880314	Yes	SR-5/US-1,N. OF	Y	9	50.9	3.6

TTMS based on WIM type 3 (9905)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
277	Point	16,429	760105	Yes	SR-15&200/US-	Y	9	61.9	7.8
284	Point	25,125	780329	Yes	SR-A1A,531' S OF	Y	9	53.6	1.8
285	Point	36,552	780311	Yes	SR-5/US-1,0.3 MI	Y	9	57	2.8

TTMS based on WIM type 3 (9929)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
152	Point	10,704	730263	Yes	SR-5/US-1,1.3 MI	Y	9	68.4	7.8
273	Point	25,087	750104	Yes	SR-50, 0.19 MI W	Y	9.5	52.6	5

TTMS based on WIM type 3 (9947)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
342	Point	52,900	970430	Yes	HEFT/SR-821, N	Y	8.5	52.2	5.3

TTMS based on WIM type 3 (9949)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
196	Point	5,648	480243	Yes	SR-97,1.3 MI S OF	Y	9.5	53	7.2
197	Point	6,882	480348	No	SR-95/US-29,450'	Y	9.5	56.6	14.9
235	Point	35,752	570167	No	SR-30/US-98,0.3	Y	9	71.3	3.5

TTMS based on WIM type 3 (9919)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
240	Point	8,530	700284	Yes	SR-A1A,360' NORTH	Y	9	54.6	3
244	Point	27,729	700345	Yes	SR-507/BABMI N CR-	Y	9	58.2	2
246	Point	35,277	700134	No	SR-9/I-95,3.34 MI. S.	Y	10.5	53.6	16.6
250	Point	13,779	700114	Yes	SR-5/US-1,0.2 MI S OF	Y	9	52.6	4.8
317	Point	2,632	880291	Yes	SR A1A-0.5 MI S	Y	9	53.4	4.8
325	Point	8,321	920065	Yes	US-192,2 MI W OF	Y	9	53.2	16

TTMS based on WIM type 3 (9926)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
94	Point	16,036	134111	No	75TH ST WEST, 789'	Y	9	53	3.3
95	Point	6,238	134020	No	MOCCASIN	Y	9	58.7	6.3
96	Point	36,689	134019	No	UNIVERSITY PKWY,	Y	9	60	5.8
97	Point	6,075	134018	No	LORRAINE RD, 675' S	Y	9	55.2	5.2
98	Point	5,862	134017	No	69TH ST E, 425' W OF	Y	9	81.9	6.3
99	Point	1,456	134016	No	CR 675, 1075' SOUTH	Y	9.5	56	19.6
100	Point	1,294	134015	No	CR 675, 1,299'	Y	9.5	56.3	19.6
101	Point	4,629	134014	No	RYE ROAD, 520'	Y	9	65.7	4.8
102	Point	11,123	134013	No	26TH STREET W, 350'	Y	9	52	3.3
103	Point	19,642	134012	No	34TH STREET W, 705'	Y	9	52	3.3
104	Point	6,611	134010	No	9TH STREET EAST,	Y	9	53	6.9
105	Point	1,323	134009	No	VERNA BETHANY	Y	9.5	53.7	22.3
106	Point	6,938	134008	No	CR 683/ELLENTON	Y	9	61.2	6.3
108	Point	9,900	134007	No	HABEN	Y	9	62.4	6.9
110	Point	23,458	134005	No	53RD AVENUE	Y	9	54	3.3
112	Point	8,314	134003	No	OLD TAMPA ROAD,	Y	9	64.3	4.8
113	Point	9,180	134002	No	UPPER MANATEE	Y	9	61.9	5.8
114	Point	10,316	134001	No	LAKEWOOD RANCH	Y	9.5	56.4	4.8
115	Point	43,177	130333	Yes	SR-70,1.3 MI W OF I-	Y	9	53.8	6.4
116	Point	26,830	130180	No	SR-43/US-301,0.5 MI	Y	9	57	7.7
117	Point	5,063	130146	No	SR-64,1 MI W OF	Y	9.5	60	19.6
118	Point	52,645	140199	Yes	SR-55/US-19,1.4 MI N	Y	9	56.3	3.8
119	Point	33,628	150302	No	SR-686,200' W OF CR-	Y	9	60	3.3
120	Point	37,974	150295	Yes	SR-55/US-19,230' N	Y	9	52.7	3.5
121	Point	50,310	150183	No	SR-93/I-275,900' S OF	Y	9	57	5.3
123	Point	16,868	150066	Yes	SR-699(GULF	Y	9	52.3	2.3

TTMS based on WIM type 4 (9948)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
24	Point	5,060	90229	No	SR-66,430' E OF	Y	9.5	61.8	14.8

TTMS based on WIM type 4 (9933)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
336	Point	6,890	930268	Yes	SR-25/US-27,0.46 MI.	Y	9.5	59.4	36.2

TTMS based on WIM type 4 (9940)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
230	Point	1,177	590252	Yes	SR 267 150' SOUTH	Y	9.5	53.8	15.5

TTMS based on WIM type 4 (9918)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
23	Point	6,841	90327	Yes	SR-25/US-27,2.7 MI	Y	9.5	57.3	30.3

TTMS based on WIM type 5 (9943)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCTR	TFCTR
217	Point	3,212	530247	Yes	SR 77, 0.35	Y	9.5	53.4	6.5
220	Point	13,138	530050	Yes	SR-75/US-	Y	9.5	60.2	15.2
221	Point	2,090	520364	Yes	SR-2, 0.97	N	9.5	59.3	13.2
242	Point	18,001	610152	Yes	SR 8/I	Y	10.5	55.5	22.9
247	Point	4,022	610344	Yes	SR-10/US	Y	9.5	58.6	5.7

TTMS based on WIM type 5 (0192)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCTR	TFCTR
185	Point	8,160	460315	Yes	SR-75/US-	Y	9	51.3	3.3
187	Point	12,709	460166	Yes	SR-30/US-	Y	9	53.3	2.1
249	Point	4,168	610253	Yes	SR 79, 443'	Y	9.5	64.3	6.5

TTMS based on WIM type 5 (9907)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCTR	TFCTR
158	Point	2,546	510313	Yes	SR-71,0.5	Y	9.5	65.4	10.7
208	Point	700	490244	No	SR-65,1.2	N	9.5	67	17.5

TTMS based on WIM type 5 (9909)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCTR	TFCTR
132	Point	581	330237	Yes	SR-51,1.3	Y	9.5	61.2	25.6
168	Point	1,207	340239	Yes	SR-24,0.6	Y	9.5	60.7	10.8

TTMS based on WIM type 6 (9937)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCTR	TFCTR
154	Point	3,824	570356	Yes	SR-	N	9.5	55.4	9
229	Point	3,415	600051	Yes	SR 83, 0.6	Y	9.5	60.1	8.3
237	Point	18,490	600366	Yes	SR-8/I-10,	Y	10.5	53.7	24.2

Tables:

Telemetered Traffic Monitoring Sites Clustering Based on Weigh in Motion Stations Residuals – 2012

Table E-3. TTMS Clustering Based on WIM Stations Residuals – 2012

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCT	TFCTR
1	Point	2,477	30270	Yes	SR-90/US-41,0.7 MI	Y	9.5	54	10.6
3	Point	22,902	10228	Yes	SR-776,427' SW OF	Y	9	51.3	5.2
10	Point	46,362	10350	Yes	SR-93/I-	Y	9	52	11.8
11	Point	3,332	40068	Yes	SR-70, 0.24 MILE	Y	9.5	54.2	22.2
20	Point	4,794	40271	Yes	SR-72,600' WEST	Y	9.5	53	11.9
21	Point	7,360	40145	Yes	SR-35/US-17,0.3 MI	Y	9	52.1	20
109	Point	16,809	134006	No	LOCKWOOD	Y	9	54.8	4.8
111	Point	11,462	134004	Yes	SR 789/GULF	Y	9	53.8	5.4
137	Point	51,232	170361	Yes	SR-93/I-75,	Y	9	57.6	11.2
138	Point	31,759	170181	Yes	SR-45/US-41,600'	Y	9	54	2.4
140	Point	89,880	170225	Yes	SR-93/I-75,0.7 MI N	Y	9	54	9.2
150	Point	18,363	730335	Yes	SR-100,1500' E OF	Y	9	52.5	3.3
151	Point	63,216	730292	Yes	SR-9/I-95,1.4 MI S	Y	9	53.9	15.6
157	Point	2,227	510316	Yes	SR-30/US-98,0.2 MI	Y	9.5	54.4	9.5
211	Point	1,434	490369	Yes	SR65, 0.22 MI	Y	9.5	61.5	12.6
214	Point	2,998	490060	Yes	SR-30/US-98,0.5 MI	Y	9.5	59.3	11.5
326	Point	16,525	900227	Yes	SR-5/US-1,200' NE	Y	9.5	54.1	8.3
327	Point	36,564	900165	Yes	SR-5/US-1,200' E	Y	9	55.1	4
328	Point	23,972	900164	Yes	SR-5/US-1, 800' S	Y	9.5	55.9	8.3

Tables:

Telemetered Traffic Monitoring Sites Clustering Based on Weigh in Motion Stations within 20 Miles – 2017

Tables E-4. TTMS Clustering Based on WIM Stations within 20 Miles – 2017

TTMS based on WIM type 1 (9956)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCTR	TFCTR
136	Point	1,406	320277	Yes	SR-6,0.4 MI EAST	Y	9.5	54.9	26.6
139	Point	1,043	320202	Yes	SR-100/US-129,0.5	Y	9.5	65.5	32.7
140	Point	44,703	320112	Yes	SR93/I75,@STATE	Y	9.5	53.5	28.3
142	Point	28,770	359902	Yes	I-10, 1.81 MI EAST	Y	9.5	54.2	21.2
144	Point	30,699	370238	Yes	SR-8/I-10,0.15 MI	Y	9.5	54.4	22.7
326	Point	44,361	329956	No	I-75	Y	9.5	53.5	28.3

TTMS based on WIM type 2 (9904)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCTR	TFCTR
121	Point	7,847	260043	No	SR-121,0.8 MILES	Y	9	71.8	6.2
122	Point	30,400	260323	Yes	SR-121/34TH	Y	9	51.8	2.4
123	Point	27,157	260185	Yes	SR-24, 1.5 MI	Y	9	53.5	7.7
124	Point	3,982	260231	Yes	SR-45/US-27,0.26	Y	9.5	56.3	13.8
327	Point	30,077	360118	Yes	SR-25/US-301,0.3	Y	9.5	52.2	14.9

TTMS based on WIM type 2 (9905)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCTR	TFCTR
205	Point	74,930	720216	Yes	SR-9A,0.7 MI S OF	Y	9	56.7	6.9
209	Point	40,139	710189	Yes	SR-15/US-17,0.6 MI	Y	9	55.3	5.7
211	Point	35,936	720172	Yes	SR-21,S END OF	Y	9	64.6	3
212	Point	42,475	720062	Yes	SR-212/US-90,0.1	Y	9	55	3.1
213	Point	132,111	720171	Yes	SR-9/I-95,0.7 MI N	Y	9	51.7	8.6
217	Point	89,795	729905	No	SR-9/I-95,2.5 MI S	Y	9	55.5	12.8
227	Point	27,076	780360	Yes	SR-13,0.276 MI. S	Y	9	58.7	3

TTMS based on WIM type 2 (9953)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCTR	TFCTR
17	Point	28,599	100162	Yes	SR-60,1 MI EAST	Y	9	55.5	7.5
18	Point	54,010	100321	Yes	SR-582/FOWLER	Y	9	59.8	2.3
19	Point	61,274	100372	Yes	SR-580, 0.36 MI E	Y	9	62.9	4.4
20	Point	7,308	100276	No	SR-674,686' W OF	Y	9.5	52.1	13.4
21	Point	13,301	100080	Yes	SR-600/US-92, 0.2	Y	9	56	8.3
22	Point	140,975	100106	Yes	SR-400/I-4, UNDER	Y	9	51	10.8
114	Point	33,441	150086	Yes	SR-600/US-92,1 MI	Y	9	54.5	4.9
254	Point	60,285	109955	Yes	SR-93/I-275, 3 MI S	Y	9	62.5	5.3
255	Point	148,347	109953	Yes	HILLSBOROUGH	Y	9	59.4	8.7
305	Point	30,711	100373	Yes	US-41, 0.5 MI S OF	Y	9	72.4	11.4

TTMS based on WIM type 3 (9918)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCTR	TFCTR
14	Point	17,190	79918	No	SR-25&80/US-	Y	9.5	56.3	19.3
251	Point	3,773	50272	Yes	SR-78,0.9 MI	Y	9.5	52.6	26.7

TTMS based on WIM type 3 (9950)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFCT	TFCT
1	Point	24,968	30351	Yes	SR-93/I-75,W OF	Y	9.5	53.8	11.2
5	Point	41,302	30094	Yes	SR-90/US-41,.3 MI SE	Y	9	56.2	2.9
8	Point	82,348	30191	Yes	SR-93/I-75,0.5 MI N OF	Y	9	56.4	8
12	Point	97,387	39950	Yes	I-75, 1.25 MI N OF CR-	Y	9	55.4	7.9
24	Point	19,700	126060	No	BEN HILL GRIFFIN	Y	9	55.2	4.3
26	Point	34,000	126019	No	SUMMERLIN RD,	Y	9	55.2	4.7
28	Point	12,400	126044	No	ESTERO BLVD, 100' N	Y	9	52.9	3.6
33	Point	22,000	126039	No	GLADIOLUS DR, W	Y	9	59.8	4
35	Point	23,000	126059	No	MIDFIELD	Y	9	55.2	12.1
37	Point	40,000	126048	No	DANIELS PKWY, E OF	Y	9	55.4	4.3
38	Point	23,500	126053	No	ALICO RD, 1800' W OF	Y	9	53.2	4.3
40	Point	22,000	126008	No	SR 865/SAN CARLOS	Y	9	54.5	3.6
47	Point	1,300	126033	No	CHAMBERLIN PKWY,	Y	9	99.9	4.3
48	Point	9,900	126063	No	IMPERIAL PKWY, N	Y	9	53.2	3.6
51	Point	102,014	120184	Yes	SR-93/I-75, 1.7 MI S OF	Y	9	59.8	9.4
52	Point	54,500	126052	No	SR 876/DANIELS	Y	9	53.2	7.4
56	Point	28,500	126042	No	BONITA BEACH	Y	9	55.2	4
57	Point	24,500	126047	No	SUMMERLIN RD S OF	Y	9	53.8	4.3
58	Point	25,000	126007	No	BONITA BEACH RD,	Y	9	52.8	3.6
59	Point	57,000	126031	No	DANIELS PKWY, 150'	Y	9	53.2	7.4
61	Point	40,500	126025	No	US 41, 500' S OF	Y	9	53.2	4
64	Point	14,200	126016	No	OLD 41 RD/CR 887,	Y	9	64.7	4.2
66	Point	41,500	126046	No	GLADIOLUS DR, W	Y	9	56.8	4
67	Point	2,300	126051	No	PAUL J DOHERTY	Y	9	99.9	4.3
70	Point	21,000	126036	No	SUMMERLIN RD,	Y	9	53.5	4.7
72	Point	37,500	126023	No	US 41, 0.25 MI N OF	Y	9	57.8	4.2
73	Point	50,500	126030	No	DANIELS PKWY, 100?	Y	9	52	4.3
74	Point	21,000	126061	No	BEN HILL	Y	9	55.2	4.3
79	Point	44,000	126010	No	ALICO RD, 1000' W OF	Y	9	52.4	4.3
80	Point	38,500	126015	No	CORKSCREW RD,	Y	9	53.2	4.3
83	Point	26,000	126045	No	SR 739/METRO	Y	9	59	7.5

TTMS based on WIM type 3 (9949)

FI	Shape	AADT	Co-site	Classed	COMM	Activ	KFC	DF	TFC
14	Point	68,451	480368	Yes	I-110, 0.6 MI S OF	Y	9	66.1	4.3
15	Point	13,428	480325	No	SR30/US98,1 MI E	Y	9	53	5.1
16	Point	26,171	480282	Yes	SR-296,320' E	Y	9	52.8	1.7
16	Point	57,750	489949	Yes	I-10, 1.6 MI E OF SR-	Y	9	51.7	11.5
16	Point	31,041	489916	Yes	SR-95/US-29, 0.8 MI	Y	9	64.4	7.2
18	Point	13,984	580398	Yes	SR-87, 180' NORTH	Y	9	60.1	6.2
19	Point	56,835	580261	No	SR-30/US-98,267' E	Y	9	55.3	3.6
31	Point	5,444	480048	Yes	SR10/US90,1 MI E	Y	9.5	58.1	8.9
33	Point	45,494	480156	Yes	I-10, 0.6 MI W SR-	Y	9	53.5	14.8

TTMS based on WIM type 3 (9923)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFCR	TFC
214	Point	22,195	740182	No	SR-A1A&200/US-	Y	9	55.1	6.5
222	Point	62,152	749923	Yes	SR-9/I-95, 2.5 MI N	Y	9.5	53.1	17.9
223	Point	68,007	740132	Yes	SR-9/I-95,2.0 MI S	Y	9.5	52.9	18

TTMS based on WIM type 3 (9931)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
119	Point	49,000	189920	No	SR-93/I-75,3.5 MI S	Y	9.5	54.7	19.8
120	Point	49,342	180358	Yes	SR-93/I-75,0.5 M N	Y	9.5	54.1	20.6
299	Point	55,230	970428	Yes	SR-91, SE OF CR561	Y	9	52.5	16.5
307	Point	36,506	110177	Yes	SR-500/US-441,0.3	Y	9	54.6	4.9
312	Point	47,836	979931	Yes	SR-91, S OF CR468	Y	9.5	54.7	16

TTMS based on WIM type 3 (9933)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCT	TFCT
231	Point	29,111	860256	Yes	SR-818/GRIFFIN	Y	9	56.3	4.5
232	Point	51,524	860384	Yes	SR858/HALLANDAL	Y	9	52.2	2.7
233	Point	212,000	860163	No	SR-9/I-95,NE OF	Y	9	50.7	5.8
234	Point	42,597	860255	Yes	SR834/SAMPLE	Y	9	51.6	4.7
235	Point	12,803	860215	Yes	SR-A1A,0.1 MI N OF	Y	9	51.9	2.6
237	Point	11,653	860381	Yes	I-595 EXPRESS, 0.5	Y	9	99.9	3.6
238	Point	261,347	860331	Yes	SR9/I95,.1 M N OF	Y	9	51.4	4.6
239	Point	28,187	860176	Yes	SR 5 / US 1 - 0.1 MI N	Y	9	53.8	2.4
241	Point	151,945	860380	Yes	I-595, 0.5 MI E OF	Y	9	55.6	6.3
242	Point	14,983	860306	Yes	SR820/HOLLYWOO	Y	9	55.7	1.9
243	Point	90,983	860362	Yes	SR-93/I-75, 0.78 MI N	Y	9	58.4	5.4
244	Point	26,252	870258	Yes	SR-915/NE 6TH	Y	9	52.8	1.5
248	Point	146,952	870137	Yes	SR 826/PALMETTO	Y	9	51.7	5.8
266	Point	27,770	860357	Yes	SR93/I75,2 MI W OF	Y	9.5	54.1	12
296	Point	136,236	970403	Yes	SR-91, N OF	Y	9	51.6	8.9
344	Point	27,760	870096	Yes	SR-9, 0.4 MI SW OF	Y	9	51.3	8.3
347	Point	0	979934	-	HEFT/SR-821, N OF	N	0	0	0
348	Point	99,438	979933	Yes	SAWGRASS	Y	9	56.6	5.1

TTMS based on WIM type 3 (9951)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
115	Point	97,918	169951	No	I-4, 0.6 MI W OF	Y	9	51.7	9.4
118	Point	17,700	169927	No	SR546/MEMORIA	Y	9	63.3	9.5
294	Point	31,345	970407	Yes	POLK PKWY/SR-	Y	9	60.6	12.9
306	Point	7,241	160230	Yes	SR-33,0.057 MI	Y	9.5	59	20.5
309	Point	58,237	160310	Yes	SR-25/US-27,280'	Y	9	52.1	8.2
315	Point	12,690	160275	Yes	SR-544,0.24 MI W	Y	9	52.9	9.8
316	Point	24,858	160274	Yes	SR-37,0.4 MI S OF	Y	9	56.8	5.1

TTMS based on WIM type 3 (9914)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
206	Point	53,000	720109	No	SR-8/I-10,@CR-	Y	9	54.2	20.8
216	Point	75,424	729914	Yes	SR-9A/I-295,3 MI	Y	9	53.2	13.6
263	Point	4,783	720235	Yes	SR-200/US-	Y	9.5	58	26.4

TTMS based on WIM type 3 (9902) within 20

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
133	Point	8,898	350279	Yes	SR-10/US-90,47' E	Y	9.5	62.4	4.9

TTMS based on WIM type 3 (9913)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
268	Point	8,073	890259	Yes	SR A1A - 0.06 MI	Y	9	53.1	3.2
270	Point	65,437	890334	Yes	SR 9 / I-95 - 0.1 MI	Y	9.5	61.8	11
271	Point	59,031	890332	Yes	SR5/US1,@ N	Y	9	60.6	3.3
274	Point	2,869	890289	Yes	SR 76 / KANNER	Y	9.5	53.1	12.4
290	Point	5,451	940195	Yes	SR 70 ,1.18 MI E	Y	9.5	57.2	15.5
292	Point	61,831	940260	Yes	SR 9/I-95-0.6 MI S	Y	9	52.1	14.2
293	Point	2,627	940144	Yes	CR 68/ORANGE	Y	9.5	58.9	20
300	Point	35,374	970421	Yes	SR-91, N OF	Y	9.5	60.7	14.8
313	Point	50,736	979913	No	SR-91, N OF	Y	9	57.7	13.8

TTMS based on WIM type 4 (9936)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
126	Point	8,241	290286	Yes	SR-47/US-441,0.1	Y	9	51.6	8
127	Point	23,458	299936	No	SR-8/I-10,@CR-	Y	9.5	55	25.9
128	Point	6,869	290037	Yes	SR-10/US-90,0.6	Y	9.5	56.8	5.8
130	Point	23,403	290269	Yes	SR-8/I-10,0.45 MI	Y	9.5	55	27.1

TTMS based on WIM type 5 (9963)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
125	Point	5,282	280073	Yes	SR-100,1.3 MI	Y	9.5	52.5	16.5
131	Point	25,154	280018	Yes	SR-200/US-	Y	9.5	53.4	19.1

TTMS based on WIM type 5 (9940)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
172	Point	8,229	509940	Yes	SR-267,1 MI N OF	Y	9	53	6.3
175	Point	6,506	500054	Yes	SR-63/US-27,0.7	Y	9.5	60.9	17.9
176	Point	2,953	560301	Yes	SR-12,1.7 MI S OF	Y	9.5	60.1	11.4
323	Point	6,004	550211	Yes	SR-20,BTWN	Y	9.5	75.2	7.5
324	Point	11,447	550207	No	SR155/MERIDIAN	Y	9	68.7	2
332	Point	1,507	500281	Yes	SR-267,0.21 MI S	Y	9.5	53.7	11.9
333	Point	68,594	550304	Yes	SR-8/I-10,1 MI W	Y	9	51.8	13

TTMS based on WIM type 5 (9906)

FID	Shape	AADT	Co-site	Classed	COMM	Activ	KFC	DF	TFC
225	Point	37,644	770102	Yes	ON US-17&92,1.6 MI	Y	9	52.	3.6
230	Point	23,265	790133	No	I-95,2.7 MI N OF	Y	9	56.	10.1
240	Point	16,175	799925	Yes	US-92,0.25 MI E OF	Y	9.5	61	5
339	Point	41,489	770197	No	SR-434,1.6 MI E OF I-	Y	9	51.	4.5
342	Point	148,000	770343	No	SR-400/I-4,1.6 MI E	Y	9	52.	6.9
343	Point	12,952	770299	Yes	SR-46,0.4 MI W OF	Y	9.5	52.	10.1

TTMS based on WIM type 5 (9943)

FID	Shape	AADT	Co-site	Classed	COMM	Activ	KFC	DFC	TFC
150	Point	9,685	470173	Yes	SR-20,0.6 MI EAST	Y	9.5	53.2	11.9
156	Point	1,948	470365	Yes	SR-69,1.4 MI N OF	Y	9.5	62.6	10.9
159	Point	3,496	470337	Yes	SR-71,.4 M N OF JIM	Y	9.5	52.5	9.7
167	Point	15,769	530117	Yes	SR-10/US-90,W OF	Y	9	51.5	5.1
168	Point	2,218	530248	Yes	SR-2,575' WEST OF	Y	9.5	59.8	23.3
173	Point	25,075	530218	Yes	SR-8/I-10,1 MI E OF	Y	9.5	55.7	25.4
184	Point	5,212	539943	Yes	SR-10/US-90,1.1 MI W	Y	9.5	54.8	7.5

TTMS based on WIM type 5 (9909)

FID	Shape	AADT	Co-site	Classed	COMM	Activ	KFC	DFC	TFC
134	Point	13,322	349909	Yes	SR-55/US-19,2 MI S	Y	9.5	57.6	8.3
135	Point	12,913	340116	Yes	SR-55/US-19,2 MI S	Y	9.5	53.7	10.6
137	Point	7,451	340278	Yes	SR-55/US-27A,158' SE	Y	9.5	56.5	13.3
141	Point	2,319	300234	Yes	SR-349,0.1 MI	Y	9.5	54.7	13

TTMS based on WIM type 5 (9947)

FID	Shape	AADT	Co-site	Classed	COMM	Activ	KFC	DFC	TFC
245	Point	18,056	870383	Yes	SR-90/US-41/SW 8TH	Y	9	53.6	7.1
246	Point	12,011	870382	Yes	SR 887 - PORT	Y	9	52.3	25.1
247	Point	37,014	870193	Yes	SR-878, 0.2 MI W SR	Y	9	76	2.3
267	Point	35,037	879947	Yes	US-27, 2.1 MILES N	Y	9	58.7	16.7
276	Point	127,151	970267	Yes	HEFT/SR-821, 1.4 M	Y	9	54	7

TTMS based on WIM type 5 (9948)

FID	Shape	AADT	Co-site	Classed	COMM	Activ	KFC	DFC	TFC
117	Point	25,441	169948	Yes	SR-25/US-27,0.8 MI S	Y	9	51.9	12.9
308	Point	11,095	160319	Yes	SR-35/US-17,0.3 MI N	Y	9.5	54.1	18.2

TTMS based on WIM type 5 (9957)

FID	Shape	AADT	Co-site	Classed	COMM	Activ	KFC	DF	TFC
162	Point	2,180	520364	Yes	SR-2, 0.97 MI W OF	Y	9.5	57.	14.9
170	Point	14,867	530050	Yes	SR-75/US-231,.7 MI S	Y	9.5	61.	15.7
171	Point	3,170	530247	Yes	SR 77, 0.35 MILES	Y	9.5	54.	7.2
183	Point	3,240	539957	No	SR - 77, SOUTH OF	Y	9	56.	9.1
200	Point	21,912	610152	Yes	SR 8/I 10,AT CR 273,	Y	9.5	56.	24.9
201	Point	4,392	610344	Yes	SR-10/US 90,0.6 MILE	Y	9.5	59	7.2
202	Point	5,402	610254	Yes	SR 77, 406' NORTH	Y	9.5	52.	9.4

TTMS based on WIM type 5 (9955)

FID	Shape	AADT	Co-site	Classed	COMM	Activ	KFC	DF	TFC
94	Point	93,555	140190	Yes	SR-93/I-75, 1.0 MI N	Y	9	57	12.8
111	Point	57,000	140013	No	SR-45/US-41,0.4 MI. N	N	9	57.	4

TTMS based on WIM type 6 (9925)

FID	Shape	AADT	Co-site	Classed	COMM	Activ	KFC	DF	TFC
221	Point	12,654	730263	Yes	SR-5/US-1,1.3 MI N	Y	9	64.	8.3
229	Point	12,078	790170	Yes	SR-442, 0.53 MI E OF	Y	9	65.	7.3

TTMS based on WIM type 6 (9929)

FID	Shape	AADT	Co-site	Classed	COMM	Activ	KFC	DF	TFC
236	Point	13,600	799929	No	SR-5/US-1,0.25 MI N	Y	9	52.	4.6
331	Point	34,752	700322	Yes	SR-9/I-95,0.9 MI S OF	Y	9.5	54.	18.8

Tables:

Telemetered Traffic Monitoring Sites Clustering Based on Weigh in Motion Stations between 20 and 40 Miles – 2017

Tables E-5. TTMS Clustering Based on WIM Stations between 20 and 40 Miles – 2017

TTMS based on WIM type 1 (9956)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFC
143	Point	3,022	370241	Yes	SR-249/US-129,300' N	Y	9.5	57.8	14.3

TTMS based on WIM type 2 (9904)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFC
132	Point	2,329	290297	Yes	SR-47,2.2 MI S OF SR-	Y	9.5	56.6	14.4
224	Point	11,622	760240	Yes	SR-20,0.4 MI EAST OF	Y	9.5	59.5	6.6
311	Point	94,509	360317	Yes	I-75,0.23 MI N OF	Y	9	52.9	19.9
318	Point	30,828	360249	Yes	SR-464,140' EAST OF	Y	9	58	4.2
337	Point	21,041	360264	Yes	SR-40,566'E OF NE 24TH	Y	9	58.9	4.7

TTMS based on WIM type 2 (9953)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFC
87	Point	55,805	140199	Yes	SR-55/US-19,1.4 MI N SR-	Y	9	55.5	4.7
88	Point	18,765	134111	No	75TH ST WEST, 789' N OF	Y	9	52.4	36
89	Point	53,857	130333	No	SR-70,1.3 MI W OF I-	Y	9	52.3	7.3
90	Point	30,788	130180	Yes	SR-43/US-301,0.5 MI SW	Y	9	59.1	5.8
91	Point	6,197	130146	Yes	SR-64,1 MI W OF	Y	9.5	61.2	14.4
92	Point	13,600	134020	No	MOCCASIN WALLOW	Y	9	59.8	14.3
93	Point	33,500	134019	No	UNIVERSITY PKWY, 650'	Y	9	55.2	6.6
95	Point	7,700	134018	No	LORRAINE RD, 675' S OF	Y	9	59.8	5.6
96	Point	7,110	134017	No	69TH ST E, 425' W OF CR	Y	9	80.4	6.9
97	Point	2,099	134016	No	CR 675, 1075' SOUTH OF	Y	9.5	58	16.7
98	Point	2,010	134015	No	CR 675, 1,299' NORTH	Y	9.5	60.7	16.7
99	Point	9,097	134014	No	RYE ROAD, 520' SOUTH	Y	9	68.6	5
100	Point	11,456	134013	No	26TH STREET W, 350'	Y	9	54.4	2.9
101	Point	18,548	134012	No	34TH STREET W, 705'	Y	9	52.3	36
102	Point	7,622	134008	No	CR 683/ELLENTON	Y	9	63.4	6.9
103	Point	10,394	134007	No	HABEN BOULEVARD,	Y	9	71.3	5.3
104	Point	19,972	134006	No	LOCKWOOD RIDGE RD,	Y	9	58.5	36
105	Point	22,719	134005	No	53RD AVENUE WEST,	Y	9	52.7	2.9
106	Point	11,877	134004	No	SR 789/GULF DRIVE @	Y	9	52.7	3.1
107	Point	8,608	134003	No	OLD TAMPA ROAD,	Y	9	58.4	36
108	Point	10,005	134002	No	UPPER MANATEE	Y	9	63.2	6.6
109	Point	17,114	134001	No	LAKEWOOD RANCH	Y	9	58.7	36
110	Point	15,675	140079	Yes	SR-35/US98&301,0.2 MI S	Y	9	57.5	12.8
112	Point	17,548	150066	Yes	SR-699(GULF BLVD),110'	Y	9	52.1	2.9
113	Point	60,323	150183	Yes	SR-93/I-275,900' S OF	Y	9	56.8	5.1
256	Point	7,859	134010	No	9TH ST E, 420 FT S OF	Y	9	52.5	36
257	Point	1,733	134009	No	VERNA BETHANY	Y	9.5	57.7	36

TTMS based on WIM type 2 (9904)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
132	Point	2,329	290297	Yes	SR-47,2.2 MI S OF	Y	9.5	56.6	14.4
224	Point	11,622	760240	Yes	SR-20,0.4 MI EAST	Y	9.5	59.5	6.6
311	Point	94,509	360317	Yes	I-75,0.23 MI N OF	Y	9	52.9	19.9
318	Point	30,828	360249	Yes	SR-464,140' EAST	Y	9	58	4.2
337	Point	21,041	360264	Yes	SR-40,566'E OF NE	Y	9	58.9	4.7

TTMS based on WIM type 2 (9905)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
129	Point	2,877	270232	Yes	SR-121,240'	Y	9.5	61.7	11.6
208	Point	5,322	720236	Yes	SRA1A,NORTH OF	Y	9.5	55.3	4.7
210	Point	18,455	710233	Yes	SR-21,0.124 MI	Y	9	55.9	6.4
226	Point	18,368	760105	Yes	SR15&20&100/US-	Y	9	63.2	8.7
228	Point	27,040	780329	Yes	SR-A1A,531' S OF	Y	9	55	2.4

TTMS based on WIM type 3 (9949)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
158	Point	7,808	480348	Yes	SR-95/US-29,450' N	Y	9.5	57	15.5
186	Point	38,839	570167	Yes	SR-30/US-98,0.3 MI	Y	9	70.7	4
188	Point	1,457	580330	Yes	SR-4,0.7 MI WEST	Y	9.5	56	18.5
189	Point	1,669	580285	Yes	SR-89,1270'	Y	9.5	52.9	11
261	Point	2,434	580251	Yes	SR-10/US-90,0.9 MI	Y	9.5	55.1	11.9
330	Point	5,850	480243	Yes	SR-97,1.3 MI S OF	Y	9.5	52.8	6.3

TTMS based on WIM type 3 (9918)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
10	Point	8,540	90327	Yes	SR-25/US-27,2.7 MI	Y	9.5	60.6	30.5
68	Point	26,500	126006	No	HOMESTEAD	Y	9	55.4	11.1
249	Point	17,355	30143	Yes	SR 29,0.4 MI S OF	Y	9.5	58.2	10.5
250	Point	15,604	70039	Yes	SR-80, 2.9 MILES	Y	9.5	55.4	10.8
281	Point	8,850	930268	Yes	SR-25/US-27,0.46	Y	9.5	62	35.2
288	Point	6,072	930257	Yes	SR-715,0.7 MI. S.	Y	9	53.1	15.6

TTMS based on WIM type 3 (9931)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
6	Point	20,588	20044	Yes	SR-55/US-19,0.2	Y	9	55.5	9.1
9	Point	20,907	20324	Yes	SR-44,0.2 MI	Y	9	51	7
16	Point	9,457	80294	Yes	SR-45/US-41,N OF	Y	9	54.8	6.7
253	Point	23,714	80283	Yes	SR-55/US-19,0.75	Y	9	53.8	5.6
264	Point	38,668	750038	Yes	SR 50,0.5 MI E CR-	Y	9	56.3	4.9
295	Point	12,993	970406	Yes	SUNCOAST	Y	9	54.5	8.8
310	Point	8,853	110262	Yes	SR-19,1.2 MI N OF	Y	9	54.5	9.9
314	Point	14,013	110246	Yes	SR-44,720' EAST	Y	9	53.6	7.3

TTMS based on WIM type 3 (9950)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
2	Point	17,582	10367	Yes	SR-45/US-41,4.6 MI	Y	9.5	51.4	8.8
23	Point	25,000	126054	No	SANTA BARBARA	Y	9	51.6	4.7
25	Point	58,000	126014	No	COLONIAL BLVD,	Y	9	58.2	4.7
27	Point	25,500	126066	No	SUMMERLIN RD,	Y	9	55.2	4.3
29	Point	29,000	126049	No	SR 78/PINE	Y	9	55.3	7.4
30	Point	40,000	126002	No	DEL PRADO	Y	9	55.2	4
31	Point	54,000	126009	No	US 41, 285' N OF	Y	9	54.6	2.8
32	Point	22,000	126034	No	PONDELLA RD, E	Y	9	67.6	7.4
34	Point	24,500	126028	No	FOWLER ST, S OF	Y	9	53.2	6
36	Point	19,600	126018	No	SIX MILE	Y	9	53.2	7.4
39	Point	45,500	126001	No	US 41, 200' N OF	Y	9	70.5	4.3
41	Point	31,000	126013	No	CAPE CORAL	Y	9	61.8	7.4
42	Point	25,500	126064	No	BAYSHORE RD,	Y	9	55.4	7.4
43	Point	15,800	126038	No	MCGREGOR	Y	9	55.3	3.6
44	Point	35,000	126043	No	COLLEGE PKWY,	Y	9	55.2	4.7
45	Point	7,337	120273	Yes	SR-31,202' NORTH	Y	9.5	53.4	28.2
46	Point	4,800	126027	No	STRINGFELLOW	Y	9.5	52.8	3.6
49	Point	37,500	126022	No	LEE BLVD/CR 884,	Y	9	63.9	4.6
50	Point	53,596	120203	Yes	SR-884,1.6 MI W	Y	9	53.2	5
53	Point	19,200	126058	No	CHIQUITA BLVD,	Y	9	59.8	12.1
54	Point	8,600	126012	No	CR 765/BURNT	Y	9.5	55.6	7.4
55	Point	22,000	126017	No	HANCOCK	Y	9	68.7	4.9
60	Point	28,000	126037	No	SR867/MCGREGO	Y	9	57.2	2.7
62	Point	45,000	126056	No	CAPE CORAL	Y	9	55.2	7.4
63	Point	8,900	126062	No	TREELINE AVE, S	Y	9	55.2	4.3
65	Point	28,500	126021	No	SR82/IMMOKOLE	Y	9	65.1	7.3
69	Point	9,800	126011	No	BUCKINGHAM	Y	9	55.4	12.2
71	Point	30,000	126041	No	SR 739/US 41B,	Y	9	53.2	6.2
75	Point	35,000	126020	No	SR 82/DR. MLK JR.	Y	9	53.2	4.3
76	Point	51,500	126050	No	VETERANS	Y	9	57.2	4.7
77	Point	25,000	126055	No	SANTA BARBARA	Y	9	51	7.4
78	Point	12,100	126003	No	CR78/PINE	Y	9.5	52.1	7.4
81	Point	32,000	126068	No	SR82/DR ML KING	Y	9	55.4	7.3
82	Point	49,500	126040	No	DEL PRADO	Y	9	55.4	7.4
84	Point	34,000	126005	No	SR 80/PALM	Y	9	64.9	11.1
85	Point	16,100	126029	No	CR867/MCGREGO	Y	9	53.3	4
86	Point	35,500	126035	No	SUMMERLIN RD,	Y	9	53.2	4.7

TTMS based on WIM type 3 (9933)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
280	Point	71,847	930101	Yes	SR80/SOUTHERN	Y	9	57.8	5.7
282	Point	203,05	930198	Yes	SR9/I95,@SW	Y	9	61.4	6.1
283	Point	26,918	930010	Yes	SR 5 / US 1 - N OF	Y	9	58.9	2
285	Point	21,457	930099	Yes	SR-7/US-441,0.7 MI	Y	9	69.2	6.4
286	Point	207,75	930174	Yes	SR 9 / I-95 @	Y	9	51.2	6.5

TTMS based on WIM type 3 (9923)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
218	Point	9,087	740047	Yes	SR15/US1,7 MI N	Y	9.5	54.9	19.2

TTMS based on WIM type 3 (9951)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
215	Point	89,199	750204	Yes	SR-528/BEELINE	Y	9	60.9	7.8
298	Point	45,500	970429	No	SR-91, S OF	Y	9	60.1	9
338	Point	36,439	750175	Yes	SR-527/ORANGE	Y	9	52.2	5.9
340	Point	60,076	750154	Yes	SR-436,1.4 MI N	Y	9	53.5	2.3
345	Point	65,402	920265	Yes	ON US-192,0.2 MI	Y	9	50.7	2.5

TTMS based on WIM type 3 (9902)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
146	Point	3,184	370242	Yes	SR-247,1.3 MI N	Y	9.5	55.7	13.2
179	Point	30,346	540375	Yes	I-10 EAST OF CR-	Y	9.5	53.9	22.5
181	Point	5,907	540312	Yes	SR 20/US 27,.665	Y	9.5	79.2	13.8
320	Point	630	330237	Yes	SR-51,1.3 MILES	Y	9.5	65.2	26.5
322	Point	4,025	330149	Yes	SR-20/US-27,0.3 MI	Y	9.5	55.8	16.1

TTMS based on WIM type 3 (9913)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
269	Point	6,976	880139	Yes	SR 60-1.5 MI E OF	Y	9.5	55.7	25.5
272	Point	23,662	880314	Yes	SR-5/US-1,N. OF	Y	9	50.9	4
277	Point	19,563	890374	Yes	MARTIN COUNTY	Y	9	66.3	4.5
284	Point	5,934	930140	Yes	SR-710/BEELINE	Y	9	63.1	21.8
289	Point	112,85	930217	Yes	SR-9/I-95,0.8 MI N	Y	9	62.9	8.4
291	Point	112,70	939952	Yes	I-95 WIM, 2.4 MI N	Y	9	64.3	7.8
301	Point	51,248	970417	Yes	SR-91, S OF	Y	9	56.2	14.3
302	Point	63,399	970416	Yes	SR-91, S OF PGA	Y	9	52.5	12.1

TTMS based on WIM type 5 (9940)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFC	DFC	TFCT
185	Point	1,404	540245	Yes	SR 59 1150'	Y	9.5	58	15.3
190	Point	16,301	590296	Yes	SR 369 (US 319) 3	Y	9.5	64.8	5.4
193	Point	1,529	590252	Yes	SR 267 150'	Y	9.5	55.8	15.4
317	Point	18,426	550376	Yes	TEST SITE SR-	Y	9	80.1	5.2
328	Point	30,929	550151	Yes	SR-20/US-27,0.7 MI	Y	9	59.4	1.6
329	Point	12,237	550349	Yes	SR-61/US-319,4.1	Y	9.5	55.8	8.1
334	Point	8,648	550300	Yes	SR363/WOODVILL	Y	9	73.1	5.7

TTMS based on WIM type 5 (9906)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
265	Point	51,210	750336	Yes	SR528,0.7	Y	9.5	53	8.9
304	Point	3,700	970223	No	SR-407,	Y	9.5	60.7	14.8
341	Point	28,204	750104	Yes	SR50,0.19	Y	9.5	51.7	4.4

TTMS based on WIM type 5 (9943)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
148	Point	11,517	460359	Yes	US231,0.2	Y	9.5	61.5	11.1
153	Point	2,389	460192	Yes	SR-20,1.1	Y	9.5	56.2	11.2
161	Point	3,024	470328	Yes	SR-71,0.4	Y	9.5	65.4	18.7
260	Point	15,200	469907	No	SR-75/US-	Y	9.5	58.6	9.5

TTMS based on WIM type 5 (9916)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
177	Point	30,136	570250	Yes	SR-189,1.6	Y	9	52.4	4.4

TTMS based on WIM type 5 (9909)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
138	Point	1,477	340239	Yes	SR-24,0.6	Y	9.5	60.6	12.1

TTMS based on WIM type 5 (9947)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
297	Point	61,395	970430	No	HEFT/SR-	Y	9	52.1	5.3

TTMS based on WIM type 5 (9948)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
13	Point	6,279	90229	Yes	SR-66,430'	Y	9	62.3	19
346	Point	10,799	920065	Yes	US-192,2	Y	9.5	56.5	13.2

TTMS based on WIM type 5 (9957)

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCT	DFCT	TFCT
191	Point	3,926	600051	Yes	SR 83, 0.6	Y	9.5	65.8	9
197	Point	22,546	600287	Yes	SR 8 (I10)	Y	9.5	55	24.1
203	Point	5,403	610253	Yes	SR 79, 443'	Y	9.5	65.2	6.4

Tables:

Telemetered Traffic Monitoring Sites Clustering Based on Weigh in Motion Stations Residuals – 2017

Table E-6. TTMS Clustering Based on WIM Stations Residuals – 2017

FID	Shape	AADT	Co-site	Classed	COMM	Active	KFCTR	DFCTR	TFCTR
3	Point	2,903	30270	Yes	SR-90/US-	Y	9.5	55.9	12.2
4	Point	60,120	10350	Yes	SR-93/I-	Y	9.5	51.5	13.1
7	Point	28,601	10228	Yes	SR-776,427'	Y	9	52.4	5.9
11	Point	9,906	40145	No	SR-35/US-	Y	9	52.9	22.1
15	Point	4,500	40068	Yes	SR-70, 0.24	Y	9.5	56.8	23.2
116	Point	109,384	170225	Yes	SR-93/I-	Y	9	53.6	10.4
145	Point	2,059	380280	Yes	SR-30/US-	Y	9.5	59.5	28.5
147	Point	34,000	465198	No	SR368(23RD	Y	9	53.2	3
152	Point	7,788	460315	Yes	SR-75/US-	Y	9	51.6	3.3
154	Point	12,373	460166	Yes	SR-30/US-	Y	9	53.2	2.2
155	Point	30,636	460308	Yes	SR-77,1865'	Y	9	56	3.8
157	Point	62,489	460305	Yes	SR-30/US-	Y	9	51.4	4.3
163	Point	2,370	510316	Yes	SR-30/US-	Y	9.5	53.8	10.6
166	Point	2,972	510313	Yes	SR-71,0.5 MI	Y	9.5	69.4	9.5
169	Point	1,665	490369	Yes	SR65, 0.22	Y	9.5	68	15.3
174	Point	3,385	490060	Yes	SR-30/US-	Y	9.5	61.3	10
178	Point	28,283	570318	Yes	SR-8/I-	Y	9	53.5	20.9
180	Point	17,594	570219	Yes	SR-85,1.9 MI	Y	9.5	67.5	4.5
182	Point	13,998	570122	Yes	SR-10/US-	Y	9.5	51.5	7.4
192	Point	51,324	600168	No	SR 30 (US	Y	9	51.1	3.8
195	Point	24,487	600366	No	SR-8/I-10,	Y	9.5	53.8	22.6
196	Point	4,488	600346	Yes	SR-187/US-	Y	9.5	63.9	7.8
198	Point	42,472	570385	Yes	SR-30/US-98,	Y	9	52.3	3.7
199	Point	3,730	570356	Yes	SR-85,0.757	Y	9.5	54.2	9.7
204	Point	16,799	700114	Yes	SR-5/US-	Y	9	54.2	5.3
207	Point	85,451	709919	Yes	SR-9/I-95, 2	Y	9	51.6	11.2
252	Point	6,296	40271	Yes	SR-72,600'	Y	9.5	52	11.9
258	Point	66,927	170361	Yes	SR-93/I-75,	Y	9	58.9	12
259	Point	33,604	170181	Yes	SR-45/US-	Y	9	52.8	3.4
262	Point	45,328	700134	Yes	SR-9/I-	Y	9.5	53	16.2
273	Point	3,086	880291	Yes	SR A1A-0.5	Y	9.5	53	6.9
275	Point	35,525	900165	No	SR-5/US-	Y	9	55.8	4.1
278	Point	18,590	900227	Yes	SR-5/US-	Y	9	53.4	7.8
279	Point	29,001	900164	Yes	SR-5/US-1,	Y	9	54.4	8.4
287	Point	15,852	930087	No	SRA1A,0.1	Y	9	55.4	3.5