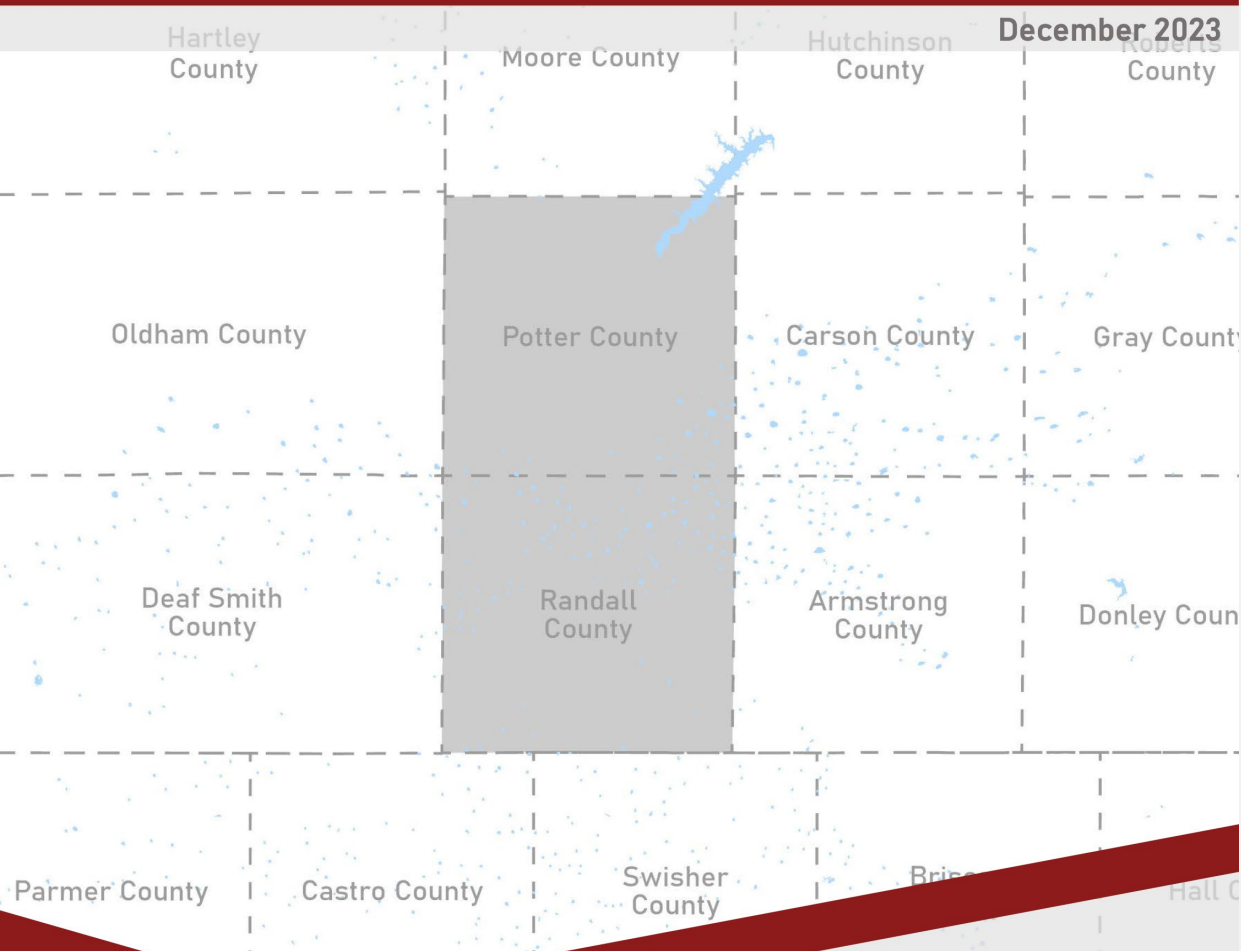


2022 Amarillo COMMERCIAL VEHICLE SURVEY

Technical Summary



Prepared by the
Texas A&M Transportation Institute



Style Definition: TxDOT Level 1

**2022 Amarillo
Commercial Vehicle Travel Survey**

TECHNICAL SUMMARY

Texas Department of Transportation Travel Survey Program

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INTRODUCTION

In 2022, the Texas Department of Transportation (TxDOT) funded a commercial vehicle survey in the Amarillo, TX, area. The purpose of this survey was to provide data that will enable TxDOT to forecast total commercial vehicle travel demand within the Amarillo urban area. The study area, shown in Figure 1, is located in the Texas Panhandle and encompasses Potter and Randall Counties. The Amarillo study area had a total population of approximately 258,219 people in 2021 as per the American Community Survey 5-Year Estimates (U.S. Census Bureau).

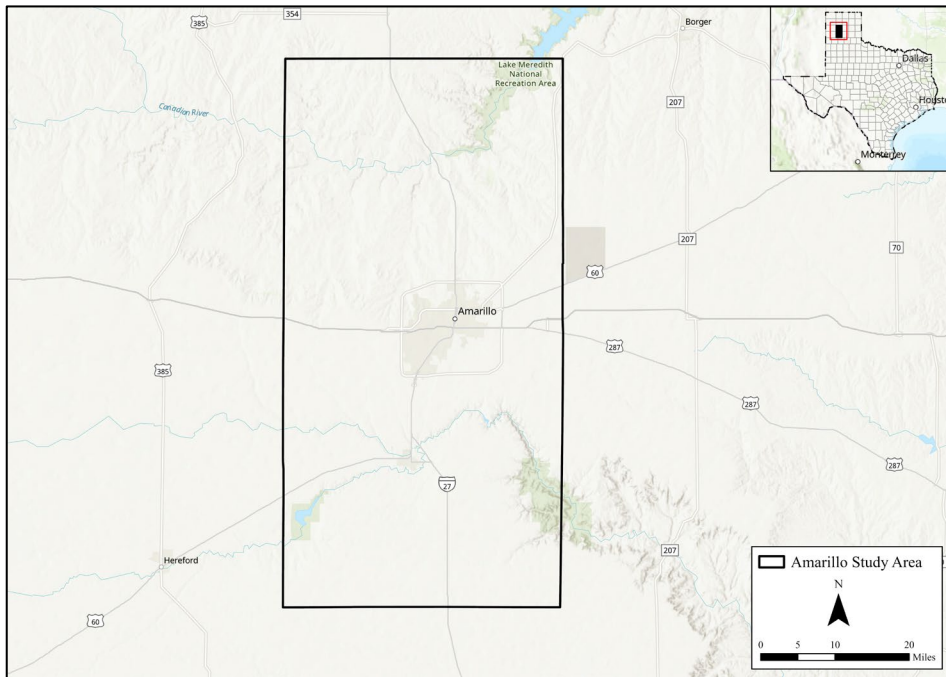


Figure 1. Amarillo Study Area.

SURVEY METHODOLOGY

The commercial vehicle survey for the Amarillo study area was conducted from April 2022 to November 2022. ETC Institute was contracted by TxDOT to conduct the commercial vehicle

survey for the study area, with technical assistance from the Texas A&M Transportation Institute (TTI).

The survey sample was randomly selected from a listing of all businesses, individuals, companies, and public agencies that own, operate, or lease commercial vehicles within the study area. This list was purchased from Data Axle and provided to TTI for categorization and randomizing. Selected businesses were contacted and requested to participate in the survey. The businesses who agreed to participate were provided the option to have their commercial vehicle driver(s) record their travel for a 24-hour period using a paper travel diary form or to use a travel survey app that would record their travel throughout the day. Those choosing to use the app could either download the app to their phone or the vendor would provide them with a cell phone with the app pre-installed for their use. Those choosing to use a paper diary were provided with a survey packet with instructions on how the survey forms should be filled out. The majority of businesses/commercial vehicle drivers used the vendor provided cell phone with the app installed to record their travel.

A total of 170 companies participated in the Amarillo commercial vehicle survey, from which a total of 309 commercial vehicle surveys were obtained. Data editing and review processes were performed by TTI to ensure that the survey data collected was complete and followed the guidelines outlined in TxDOT's bid specification for the project. A data check program was also used to examine the accuracy of geocoding locations and the logic of survey responses.

SURVEY RESULTS

Surveyed Commercial Vehicle Characteristics

Commercial vehicles that participated in the Amarillo commercial vehicle survey were distinguished based on the nine classification types listed in Table 1. These were further categorized by commercial type as either major cargo/freight transport or local service vehicles, simply referred to in this report as cargo vehicles and service vehicles, respectively.

Cargo vehicles were defined as vehicles mainly used to transport cargo or freight, which were typically bulk goods, materials, and cargo in large quantities for wholesale distribution. Service vehicles were defined as vehicles mainly used to perform services such as those used by building contractors, plumbers, electricians, cable and telephone services/repairs, and delivery

vans/vehicles used by local retailers. These also included company fleet vehicles or fleets and maintenance vehicles of public agencies such as TxDOT, the city, county, or school districts.

Table 1 shows the distribution of surveyed vehicles by vehicle classification type and commercial type. Of the total 309 vehicles surveyed, 155 were cargo vehicles and 154 were service vehicles. Among cargo vehicles, approximately 24 percent were pick-up trucks, 20 percent were vans, and 21 percent were single unit 2-axle (6-wheel) trucks. Among service vehicles, approximately 57 percent were pick-up trucks, 14 percent were vans, and 13 percent were passenger cars.

Table 1. Vehicle Classification Type of Surveyed Commercial Vehicles.

Vehicle Classification	Cargo Vehicles		Service Vehicles		Total Vehicles	
	Number of Vehicles	Percent of Cargo	Number of Vehicles	Percent of Service	Number of Vehicles	Percent of Total
Passenger Car	0	0.0%	21	13.6%	21	6.8%
Pick-up	38	24.5%	88	57.1%	126	40.8%
Van (Cargo or Minivan)	31	20.0%	22	14.3%	53	17.2%
Sport Utility Vehicle (SUV)	18	11.6%	18	11.7%	36	11.7%
Dump Truck (all axle/wheel combinations)	1	0.6%	0	0.0%	1	0.3%
Tow Truck (all axle/wheel combinations)	1	0.6%	0	0.0%	1	0.3%
Single Unit 2-axle (6 wheels)	34	21.9%	3	1.9%	37	12.0%
Single Unit 3-axle (10 wheels)	13	8.4%	0	0.0%	13	4.2%
Semi (all Tractor-Trailer combinations)	19	12.3%	0	0.0%	19	6.1%
Other	0	0.0%	2	1.3%	2	0.6%
All Vehicles	155	100%	154	100%	309	100%

Figure 2 shows the distribution of surveyed vehicles by fuel type. Approximately 18 percent of the surveyed vehicles used diesel, and 82 percent used gasoline. Among cargo vehicles, 67 percent used gasoline, and 33 percent used diesel. Among service vehicles, 98 percent used gasoline, and 2 percent used diesel. Across the surveyed vehicles, cargo vehicles use a combination of gasoline and diesel with a higher reliance on gasoline, while service vehicles predominantly use gasoline and very little diesel. This could be due to the significantly higher share of heavy vehicles in the cargo sample compared to service.

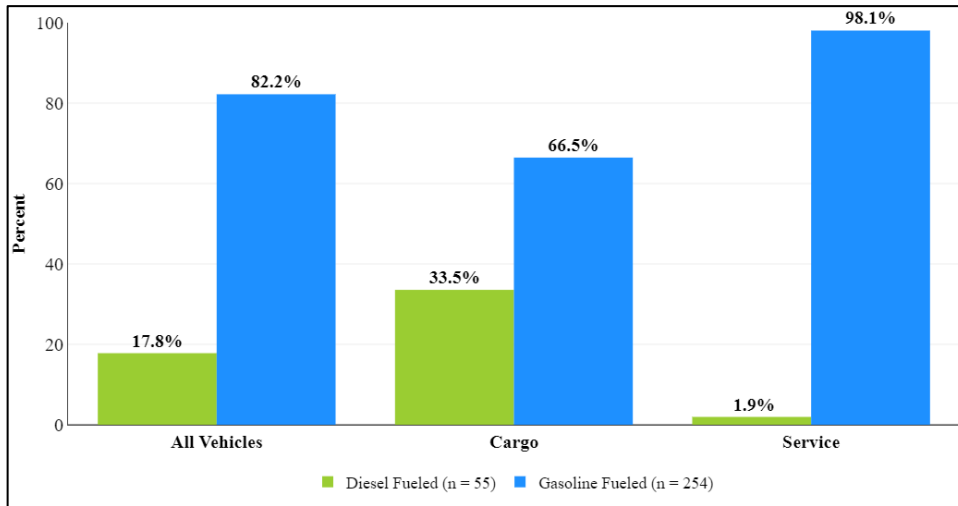


Figure 2. Type of Fuel Used by Surveyed Commercial Vehicles.

Table 2 shows the distribution of surveyed vehicles by gross vehicle weight. The survey reports commercial travel predominantly from vehicles weighing 14,000 lb. or less, making up about two-thirds of cargo vehicle samples and almost all of service vehicles. In contrast, heavy-duty vehicles made up a significant share of cargo vehicle samples. Overall, about 2 out of 3 vehicles surveyed were light-duty vehicles weighing 10,000 lb. or less.

Table 2. Gross Vehicle Weight.

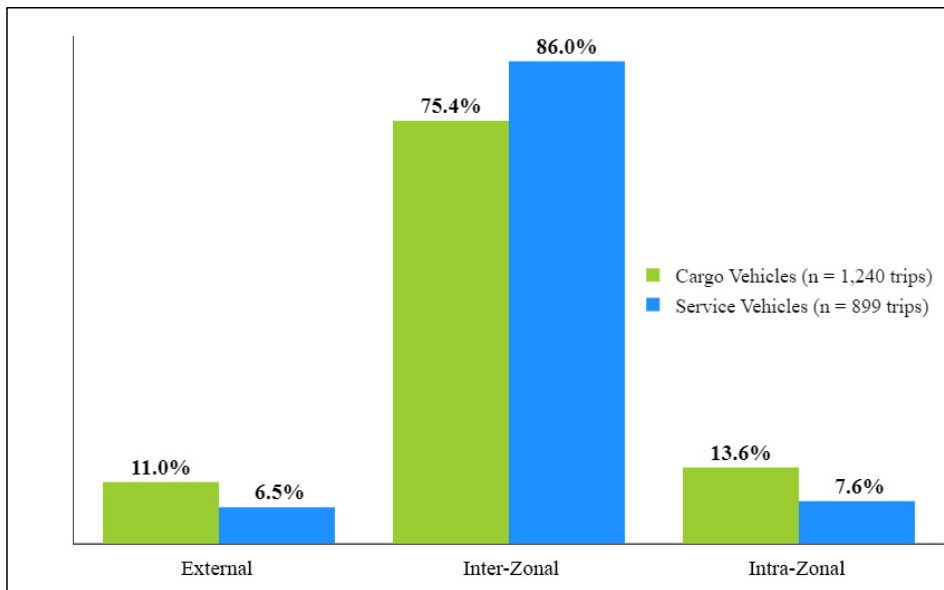
Gross Vehicle Weight (lb.) ¹	Cargo		Service		Total	
	Number of Vehicles	Percent of Cargo Vehicles	Number of Vehicles	Percent of Service Vehicles	Number of Vehicles	Percent of Total Vehicles
< 10,000	77	49.7%	131	85.1%	208	67.3%
10,000–14,000	28	18.1%	19	12.3%	47	15.2%
14,000–16,000	3	1.9%	0	0.0%	3	1.0%
16,000–19,500	2	1.3%	0	0.0%	2	0.6%
19,500–26,000	2	1.3%	0	0.0%	2	0.6%
26,000–33,000	5	3.2%	1	0.6%	6	1.9%
33,000–60,000	12	7.7%	3	1.9%	15	4.9%
60,000 +	22	14.2%	0	0.0%	22	7.1%
Unknown	4	2.6%	0	0.0%	4	1.3%
Total	155	100.0%	154	100.0%	309	100.0%

¹ Upper bound not included in gross vehicle weight categories (e.g., 10,000 lb. is in 10,000 to 14,000 lb. Category but 14,000 lb. is not).

Trip Frequency

The surveyed vehicles generated a total of 2,139 trips, of which 1,945 were internal trips and 194 were external trips. Internal trips were defined as those trips made within the Amarillo area. These trips were further distinguished by travel within or between traffic analysis zones (TAZs). Inter-zonal trips were those trips made from one zone to another, while intra-zonal trips were made within the same zone. External trips were those trips with at least one end made outside of the study area.

Figure 3 shows the distribution of inter-zonal, intra-zonal, and external trips, while Table 3 provides the breakdown of these trips. Cargo vehicles generated 1240 trips, of which approximately 75 percent were inter-zonal trips, 11 percent were external trips, and 14 percent were intra-zonal trips. Service vehicles generated 899 trips, of which 86 percent were inter-zonal trips, 6 percent were external trips, and 8 percent were intra-zonal trips.



*Percentages may not sum to one due to rounding.

Figure 3. Inter-Zonal, Intra-Zonal, and External Trips.

Table 3. Total Internal and External Trips.

Trip Type	Cargo (155 Vehicles)			Service (154 Vehicles)			Total (309 Vehicles)		
	Number of Trips	Percent of Total	Trips per Veh.	Number of Trips	Percent of Total	Trips per Veh.	Number of Trips	Percent of Total	Trips per Veh.
Inter-Zonal	935	75.4%	6.0	773	86.0%	5.0	1,708	79.9%	5.5
Intra-Zonal	169	13.6%	1.1	68	7.6%	0.4	237	11.1%	0.8
Total Internal	1104	89.0%	7.1	841	93.5%	5.5	1,945	90.9%	6.3
External	136	11.0%	0.9	58	6.5%	0.4	194	9.1%	0.6
Total	1240	100.0%	8.0	899	100.0%	5.8	2,139	100.0%	6.9

*Percentages and trips per vehicle sum may vary due to rounding.

Figure 4 shows the distribution of total trips (internal and external trips), which varied from one to 57 trips per vehicle on the survey day. The average number of total trips per day was 8.0 trips for cargo vehicles and 5.8 trips for service vehicles. The reported 20 or more cargo trips (shown on the far-right side of the chart) were associated with 9 vehicle records from the public administration, retail, and other services sectors. Whereas the 20 or more service trips (shown on the far-right side of the chart) were associated with 5 service vehicle records from the public administration, information, and wholesale trade sectors.

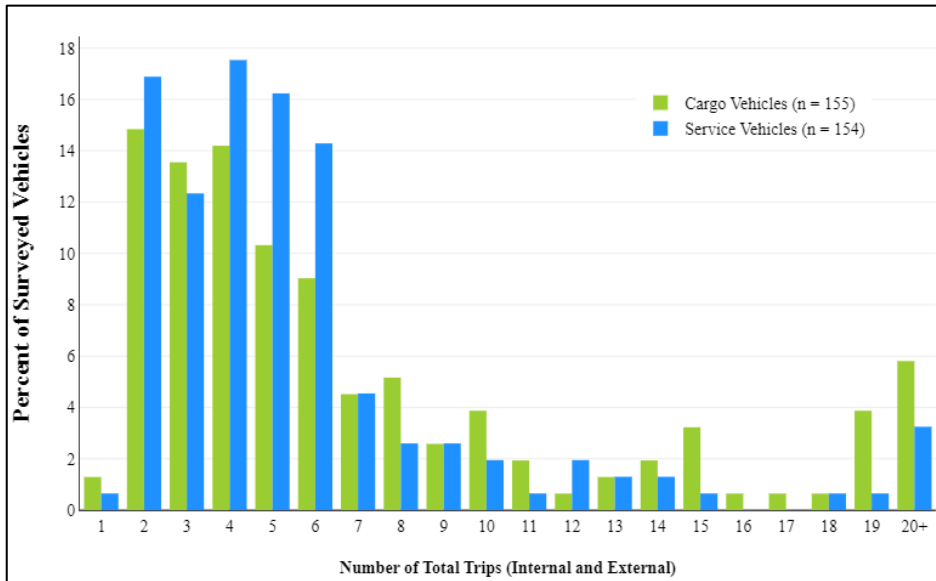
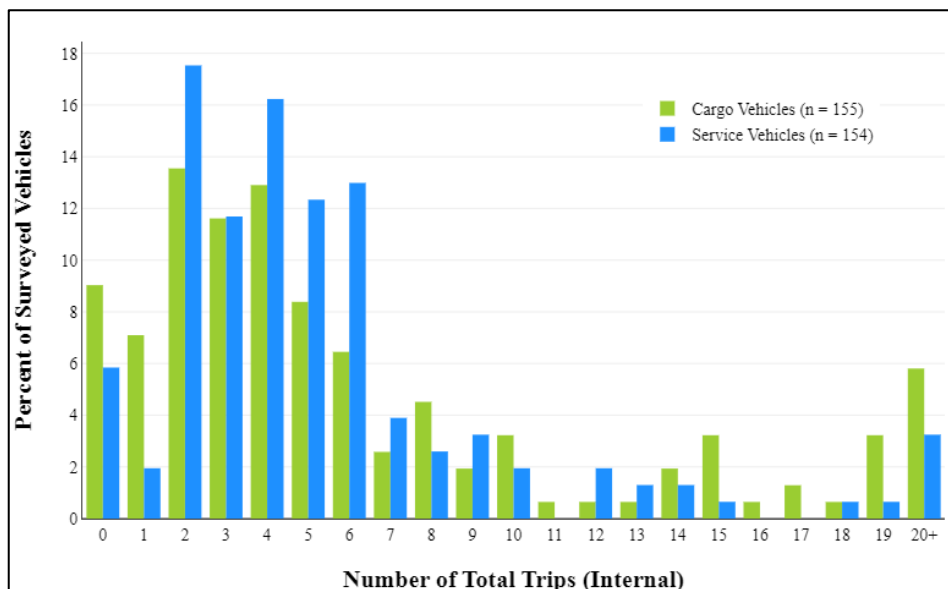


Figure 4. Total Trips per Vehicle.

Figure 5 shows the distribution of internal trips only by vehicle type. Approximately 9 percent of cargo vehicles and 5 percent of service vehicles made no internal trips on the survey day. Approximately 7 percent of cargo vehicles made only one internal trip, while 2 percent of service vehicles made only one internal trip. The average number of internal trips per day was 7.1 trips for cargo vehicles and 5.5 trips for service vehicles. The reported 20 or more cargo trips (shown on the far-right side of the chart) were associated with 9 vehicle records from the public administration, retail, and other services sectors. Whereas the 20 or more service trips (shown on the far-right side of the chart) were associated with 5 service vehicle records from the public administration, information, and wholesale trade sectors.



*The vehicles reporting zero trips in this figure are vehicles that primarily only reported external trips.

Figure 5. Total Internal Trips per Vehicle.

Trip Characteristics

Information on travel purposes and the type of land use activity where these trips occurred are important in estimating commercial vehicle trip patterns. The analysis of trips presented in this section is based solely on internal trips and does not include external trips.

Table 4 shows the distribution of internal trips by land use type at trip destinations. The top destinations for cargo vehicles were warehouse/wholesale trade, residential locations, and retail locations. While the top destinations for service vehicles were residential locations, warehouse/wholesale trade, and office buildings. The educational facilities reported a relatively higher share of cargo trips compared to service.

Table 4. Distribution of Internal Trips by Land Use Type at Trip Destinations.

Land Use	Cargo		Service	
	Number	Percent of Cargo	Number	Percent of Service
Office Building (Non-Government)	145	13.1%	94	11.2%
Retail/Shopping	158	14.3%	80	9.5%
Industrial/Manufacturing	57	5.2%	15	1.8%
Medical/Hospital	22	2.0%	6	0.7%
Education (< 12th Grade)	71	6.4%	12	1.4%
Education (College, Trade)	14	1.3%	4	0.5%
Government Office/Building	70	6.3%	54	6.4%
Residential	185	16.8%	206	24.5%
Convenience Store/Gas Station	75	6.8%	72	8.6%
Grocery Store	4	0.4%	1	0.1%
Restaurant/Fast Food/Bar & Grill	54	4.9%	38	4.5%
Bank/Financial Institution	9	0.8%	29	3.4%
Transportation, Warehousing, and Wholesale Trade	187	16.9%	127	15.1%
Construction Site	27	2.4%	30	3.6%
Other	26	2.4%	72	8.6%
Refused/Unknown	0	0.0%	1	0.1%
Total Trips	1104	100.0%	841	100.0%

Trip Length

Network matrices available for the study area were used to estimate trip lengths. The network matrices provide travel distance and time estimates from one TAZ zone to all other TAZ zones in the Amarillo study area. Since each reported trip in the survey was coded with a TAZ zone number assigned to the study area, it was then possible to estimate the trip length based on the distance provided in the network matrix. Figure 6 shows the TAZ boundary, base locations of surveyed

vehicles within the Amarillo study area, and the origin and destination TAZ locations of trips made by the surveyed vehicles.

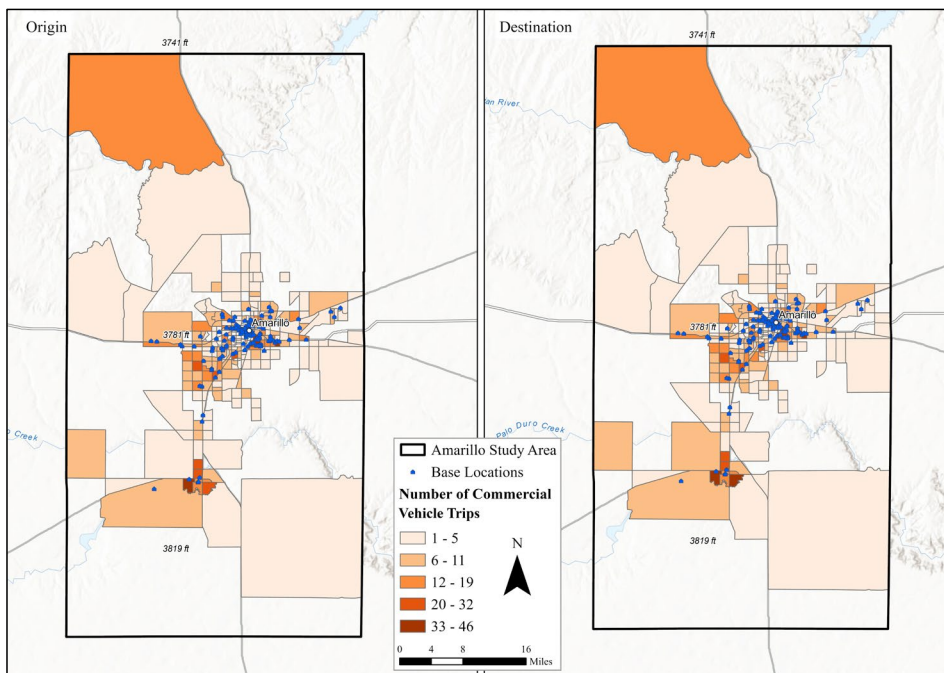


Figure 6. Trip Origins and Destinations of Surveyed Commercial Vehicles.

Since commercial vehicles tend to complete tours throughout the day (vehicle returns to the original base location), the two maps in Figure 6 are very similar, with the main differences being where the complete tour did not occur. Trips that had an origin or a destination outside of the Amarillo study area were considered external trips and not included in the trip length analysis.

The results presented in this section pertain to trip length characteristics for the 1,708 inter-zonal trips only. Table 5 shows the trip length frequency distribution (TLFD), grouped at five-mile intervals, while Figure 7 shows the ungrouped TLFDs. Approximately 70 percent of the cargo vehicles and 63 percent of the service vehicle trips had trip lengths of less than or equal to five miles. Additionally, 19 percent of the cargo vehicle trips and 24 percent of the service vehicles had trip lengths between five miles and 10 miles. The longest trip lengths reported by cargo and service vehicles were 38 and 31 miles, respectively. The average trip length for cargo vehicles was

4.6 miles while that for service vehicles was 5.0 miles. Over 65 percent of vehicle trips reported were 5 miles or less in length.

Table 5. Trip Length Frequency Distributions (Grouped Interval).

Trip Length (miles) ¹	Cargo Vehicles		Service Vehicles		All Vehicles	
	Number of Trips	Percent of Total	Number of Trips	Percent of Total	Number of Trips	Percent of Total
<= 5	659	70.5%	493	63.8%	1152	67.4%
5 - 10	181	19.4%	192	24.8%	373	21.8%
10 - 15	53	5.7%	61	7.9%	114	6.7%
15 - 20	15	1.6%	12	1.6%	27	1.6%
20 - 25	7	0.7%	6	0.8%	13	0.8%
25 - 30	7	0.7%	1	0.1%	8	0.5%
30 - 35	6	0.6%	8	1.0%	14	0.8%
35 - 40	7	0.7%	0	0.0%	7	0.4%
Total	935	100%	773	100%	1708	100%

¹ Upper bound included in trip length categories (e.g., 10 miles is in 5–10 mile category).

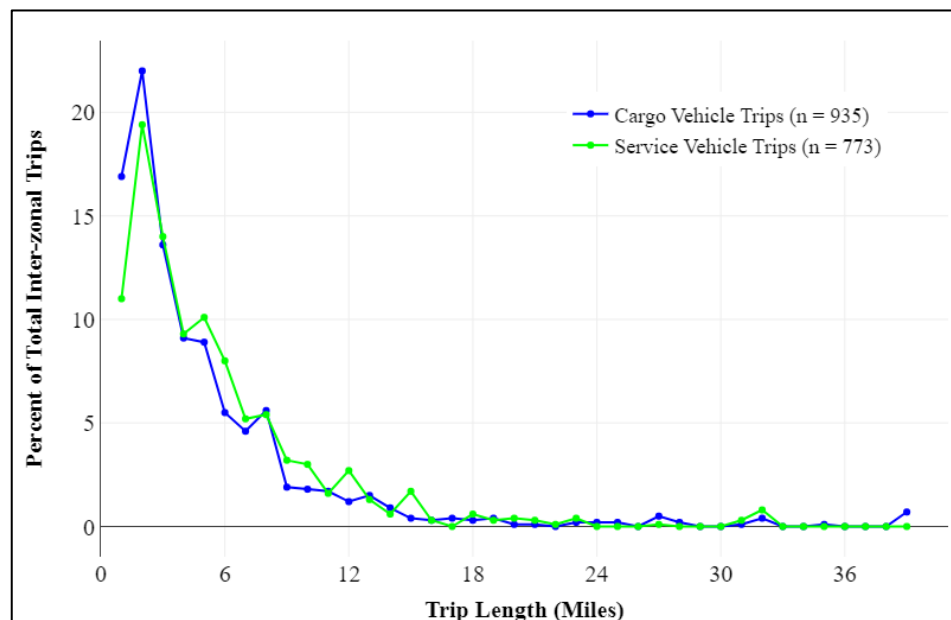


Figure 7. Surveyed Commercial Vehicle Trips TLFD.

Travel Time and Speed

A key outcome of the Amarillo commercial vehicle survey was travel logs on the arrival and departure times for each trip made by the surveyed commercial vehicles. These travel logs can be compared with the network travel time matrix table available for the study area. The travel time estimates were generated from the network travel time matrix table available for the Amarillo study area, and travel speed estimates were derived from the estimated trip lengths.

Table 6 shows the travel time frequency distributions of inter-zonal trips, grouped at five-minute intervals, while Figure 8 shows the ungrouped TLFDs. Approximately 49 percent of the trips made by cargo vehicles were less than or equal to 5 minutes, 27 percent were between 5 and 10 minutes, and 13 percent were between 10 and 15 minutes. For service vehicles, approximately 40 percent of the trips were less than or equal to 5 minutes, 33 percent were between 5 and 10 minutes, and 15 percent were between 10 and 15 minutes. The longest duration of travel time for cargo vehicles was 52 minutes and service vehicles were 39 minutes. The average duration of travel time for cargo and service vehicles was 7 minutes and 8 minutes, respectively.

Table 6. Travel Time Frequency Distributions (Grouped Interval).

Travel Time (minutes)	Cargo		Service		All Vehicles	
	Number of Trips	Percent of Total	Number of Trips	Percent of Total	Number of Trips	Percent of Total
<= 5	461	49.3%	316	40.9%	777	45.5%
5 - 10	261	27.9%	258	33.4%	519	30.4%
10 - 15	130	13.9%	116	15.0%	246	14.4%
15 - 20	41	4.4%	51	6.6%	92	5.4%
20 - 25	13	1.4%	14	1.8%	27	1.6%
25 - 30	5	0.5%	9	1.2%	14	0.8%
30 - 35	11	1.2%	1	0.1%	12	0.7%
35 - 40	5	0.5%	8	1.0%	13	0.8%
44 - 45	1	0.1%	0	0.0%	1	0.1%
45 - 50	0	0.0%	0	0.0%	0	0.0%
50 - 55	7	0.7%	0	0.0%	7	0.4%
Total	935	100.0%	773	100.0%	1708	100.0%

¹ Upper bound included in travel time categories (e.g., 10 minutes is in 5–10 minute category).

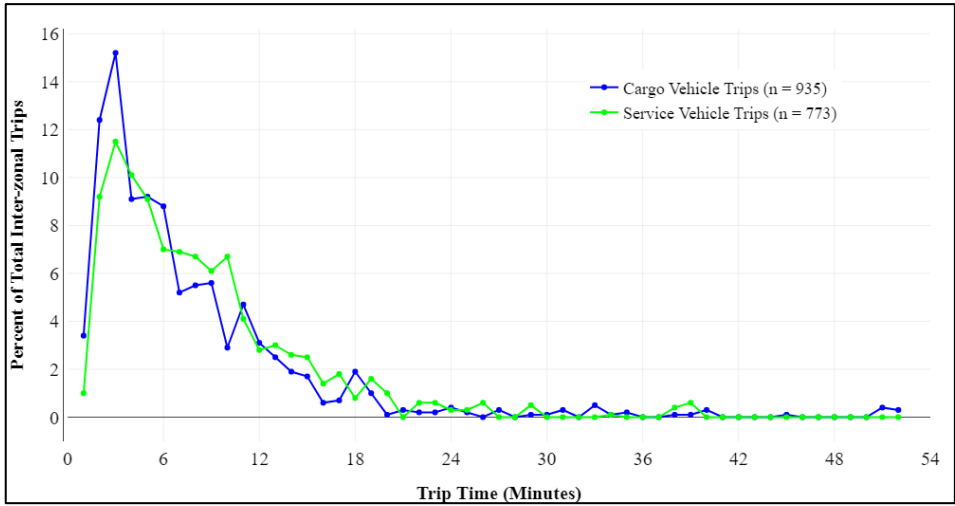


Figure 8. Surveyed Commercial Vehicle Trips Travel Time.

SURVEY SUMMARY

The Amarillo commercial vehicle survey was conducted in the spring of 2022. The survey collected vehicle and trip data from 309 commercial vehicles from 170 businesses that agreed to participate in the survey. The purpose of the survey was to collect data needed to estimate the amount and characteristics of commercial vehicle travel in the Amarillo area that is needed as an important input to the Amarillo MPO's travel demand model. The model is used to assess current and future traffic levels and conditions on area roadways, assisting TxDOT and the MPO in planning and prioritizing transportation projects in the Amarillo area. Based on the results from the survey, significant differences as well as similarities in travel characteristics were observed between cargo vehicles and service vehicles.

Of the total 309 surveyed vehicles, 155 were cargo vehicles and 154 were service vehicles. Among cargo vehicles, approximately 24 percent were pick-up trucks, 20 percent were vans, and 21 percent were single unit 2-axle (6-wheel) trucks. Among service vehicles, approximately 57 percent were pick-up trucks, 14 percent were vans, and 13 percent were passenger cars. In terms of fuel use, approximately 66 percent of cargo vehicles used gasoline, and 33 percent used diesel, while 98 percent of service vehicles used gasoline, and 2 percent used diesel. In terms of weight class, approximately 50 percent of cargo vehicles and 85 percent of service vehicles were light-duty vehicles (less than 10,000 lb.).

The following insights were drawn from the analysis conducted for the 2022 Amarillo Commercial Vehicle Survey:

- Surveyed cargo vehicles made an average of 8.0 total trips per day, compared to 5.8 trips per day for service vehicles.
- Cargo vehicles produced 7.1 internal trips per day, with an average travel distance of 4.6 miles.
- Service vehicles made 5.5 internal trips per day, with an average trip length of 5.0 miles.
- The average travel time per trip for cargo vehicles was 7.2 minutes, and for service vehicles, the average travel time per trip was 7.8 minutes.
- The top destinations for cargo vehicles were warehouse/wholesale trade (16.9%), residential locations (16.8%), and retail locations (14.3%).

- The top destinations for service vehicles were residential locations (24.5%), warehouse/wholesale trade (15.1%), and office buildings (11.2%).

Using the above insights, upon initiation of the next update or calibration to the Amarillo travel demand model, the processed and analyzed data from this survey will be utilized to develop final model inputs of commercial vehicle travel. These final inputs are developed at the time of model development to ensure the incorporation of the latest TAZ system, model area boundary, and other parameters in developing the final commercial vehicle travel estimates.